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ILLUSTRATIONS

OF SOME OF THE

GRASSES

OF THE

SOUTHERN PUNJÁB

BEING PHOTO-LITHOGRAPHS OF SOME OF
THE PRINCIPAL GRASSES FOUND AT HISSAR

54781

WITH SHORT DESCRIPTIVE LETTERPRESS

BY

WILLIAM COLDSTREAM, B.A. Edin.

BENGAL CIVIL SERVICE, FELLOW OF THE PUNJÁB UNIVERSITY, MEMBER
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'Of all sorts of vegetation the Grasses seem to be most neglected. Neither the farmer nor the grasier seem to distinguish the annual from the perennial, the hardy from the tender, nor the succulent and nutritive from the dry and fuiceless.

'The study of grasses would be of great consequence to a northerly and grazing kingdom. The botanist that could improve the sward of the district where he lived would be a useful member of society; to raise a thick turf on a naked soil would be worth volumes of systematic knowledge; and he would be the best commonwealth's man that could occasion the growth of "two blades of grass where one alone was seen before."'

WHITE'S *Natural History of Selborne.*

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INTRODUCTION.[1]

THE tract of country lying on the south of the Panjáb, to the west of Delhi, and stretching across the almost streamless tract to Multan and Bahâwalpúr, is in many parts unirrigated by wells or canals; and large areas are deserts of sand on which but little vegetation can find nourishment. The tract is touched by the Jamna on the east, and by the Satlaj on the west. It constituted until recently the Civil Division of Hissár, which, however, in a recent distribution of administrative charges, has been absorbed in other Civil Divisions of the Panjáb. This district may be said to have a length of about 200 miles, extending from about latitude 28° 20′ to 30° 17′, and situated between 73° 57′ and 77° E. longitude. The area is about 8,500 square miles, and the population is about 1½ millions, or say 175 to the square mile.

In the centre of this tract lies the Hissár District, in the heart of which, and with an area of some sixty-three square miles, is situated the great Government Cattle Farm of Hissár, where for many years cattle of the finest Indian breeds have been reared by Government, principally for the supply of the Ordnance and Transport Departments, but also to some extent for distribution throughout the country, with the aim of improving the commoner indigenous breeds. The *Bir* or grass lands of this great farm are of very wide extent, and in the rainy season a large variety of grasses, of more or less value as fodder, grow luxuriantly over its vast parks. From the Hissár Bir and its immediate neighbourhood most of the species contained in this collection were collected.

The north-eastern and eastern part of the Hissár District forms, with part of the adjoining district of Rohtak, the tract of country known as Hariána. Sir William Hunter says: 'The Western Jamna Canal now fertilises a large number of its villages; but under its series of native rulers, Hariána was known as a dry region, bordering on the outskirts of the great desert. In 1783 the terrible famine known as the *San Chálísa* devastated almost the whole surrounding country, which lay waste for several years. From 1795 to 1802 Hariána was the scene of the exploits and rule of the famous adventurer George Thomas.'

The banks of the Satlaj and the Jamna are extremely fertile; and indeed, except in the sandy portions, the soil of this region is prolific during the rainy season; and, where there is canal irrigation, at other seasons also. The Western Jamna Canal, with its branches to Rohtak and Hissár, carries fertility for hundreds of miles along its immediate course, right up to the sandy desert of Bikaner; a branch of the lately opened Sirhind Canal also extends into the tract; and the Ghaggar stream, with numerous natural and artificial channels connected with it, all of which are filled at least in the rainy season, does much to fertilise a considerable tract of country.

On the whole, however, the Southern Panjáb is dry, hot, and sandy, and for the most part its crops depend upon the periodical rains.

General MacMahon, who was for some years Commissioner of the Hissár Division, and who is well known as a geologist, describes the soil of this tract as 'for the most part light alluvium, deposited at a remote period by the rivers Satlaj, Jamna, Saraswati, Ghaggar, and Chitrang; some of which, as the Satlaj and Jamna, have in the course of ages gradually shifted their beds, whilst others, as the Saraswati, have from various causes dwindled into insignificance. Towards the borders of Bikáner, and Shekhawati, on the south-west, the soil becomes extremely sandy. West and south-west winds, which prevail in this part of the Panjáb for the greater part

[1] This Introduction is based upon a paper read before the Royal Botanical Society of Edinburgh in 1885.

of the year, and the dust-storms, which are of almost daily occurrence during May and June, have gradually transported fine sand from the great Indian Desert between Sind and Rajputana, and spread it over this tract.'

'Along the Satlaj, the Ghaggar, and the Western Jamna Canal (which until recent years flowed in the bed of the ancient Chitrang) the fine particles of clay held in suspension by their waters have gradually converted the light alluvium into stiff soils, such as are locally named as Dákar and Matyár. A similar result has ensued in other places by the surface drainage having worked out the argillaceous matter from the soil on high levels and deposited it in hollows.'

The rainfall varies considerably throughout the tract, and seems to fall steadily from the south-east to the north-west. It is about twenty inches near the Jamna, and declines to some twelve and a half inches on the banks of the Satlaj.

The temperature is high, but there is a very considerable difference between that of the winter and that of the summer season. There are not seldom frosty nights in winter, while in summer we constantly find the thermometer ranging inside the house from 90° to 100°. Outside, even in the shade, it rises to many degrees above 100°.

The arboreal vegetation is characteristic of the climate. The *Acacia arabica*, known as 'Kikar,' and the *Acacia leucophlœa*, called 'Ronj' by the people, are common; also the 'Ber' or 'Beri' (*Zizyphus jujuba*) and 'Jharberi' (*Zizyphus nummularius*). The first is probably the commonest tree in the district. It is also one of increasing value, for its wood is hard and durable; its leaves are a valuable fodder, and its bark is largely used as a tanning agent. In the dry tracts the natural arboreal vegetation is composed largely of 'Jhand' (*Prosopis spicigera*), 'Jál' (*Salvadora oleoides*), 'Karil' (*Capparis aphylla*), besides stunted acacias. On the banks of the canal the 'Shisham' or 'Sissú' (*Dalbergia sissoo*), a congener of the tree which yields the Bombay Blackwood, grows well and rapidly. One of the most interesting trees of the region, and one in a degree peculiar to it, as compared with the rest of the Panjáb, is the Rohira (*Tecoma undulata*), which makes quite a show of brilliant orange colour blossom even in the barren and sandy parts of the district. Among other interesting plants of the dry jungles may be mentioned the *Ceropegia esculenta*, called in Hissár 'Ghilot.' This is rather rare throughout India as a whole—so rare indeed that the Herbarium at Seharunpore had no specimen of it, but it is common enough about Hissár, where it matures its tubers during the months of June and July. The villagers and herdsmen dig up its tubers, and eat them as vegetables. Its leaves are also eaten. They are extremely variable in form,—are on some plants long, narrow, and fleshy, and on others triangular and sagittate.

There are two harvests of cereals, the spring harvest and the autumn one. The principal harvest is the autumn one; and it consists, as far as cereals are concerned, chiefly of sorghum (*Sorghum vulgare*) and millet (*Pencillaria spicata*). These grains are the staple food of the people; and the stalks form a large proportion of the fodder consumed by the cattle. They grow very luxuriantly, and their stems are often ten feet high, and even reach twelve and fourteen feet. The sorghum is locally termed 'Joár,' and the millet 'Bájra.' The joár is a very prolific crop,—one of the most profitable to the Indian farmer. There is a curious fact regarding its qualities as food for cattle (for which it is largely used both green and dry), viz., that in a dry season, before it flowers, the plant is poisonous to cattle. The natives in the Panjáb say the plant is 'áwar ke márá' (drought-stricken), and cattle eating it in large quantities sometimes suffer much from it. When so affected, the remedy applied in some parts of the country is to drive them into a pond; the bath appears to have a reviving and stimulating effect. This poisonous quality is shared by its congener the wild *Sorghum halepense*, called by the natives 'Barú,' delineated on Plate xv. of the succeeding pages. It may be mentioned that the crops in these regions grow on wonderfully unpromising-looking soil. Even the sandhills, formed of almost pure siliceous sand, heaped together by the action of the wind, under the fertilising influence of the rainfall, produce wonderful crops. The farmer in such

localities dreads too heavy a rain, because it is apt to wash his crop out of the sloping ground of the sandhill.

A considerable quantity of rice is also cultivated.

The principal cereal of the spring harvest is wheat.

Some sugar-cane is also raised in the good lands.

The above are the principal of the CULTIVATED GRASSES.

The WILD GRASSES of this region are very numerous; and their nutritious qualities as fodder render them a most valuable natural product in a district where the wealth of the people consists, to a considerable extent, of cattle. It is only very recently that they have been subjected to any systematic study with a view to the benefit of this region. Little has yet been attempted in the way of their cultivation, their improvement by selection of seed, sowing them in masses, or ascertaining the best means of propagating those of good quality. We have not yet had any complete series of experiments made or published such as those made sixty years ago in England, and described in Sinclair's *Hortus Gramineus Woburnensis*, the results of which are still considered valuable and reliable; nor have we had the pastures of India submitted to the scientific analysis which those of England received at the hands of Mr. Faunce De Laune, in his paper in the Journal of the Royal Agricultural Society of England.[1]

Still, during the last four years, our acquaintance with the grasses has considerably increased; and something has been done in the way of eliciting from the native farmer his opinion, well-founded on long experience, of their respective qualities as fodder, as well as of ascertaining their value when grown on cantonment grass farms for the use of cavalry regiments. Practical workers in this field have been Captain George Wingate, on the Allahabad and Cawnpore Farms, and Captain Marrett, Superintendent of the Government Farm at Hissár.

Mr. Duthie, Director of the Botanical Department in Northern India, has already published a monograph on *The Fodder Grasses of Northern India*,[2] with two volumes of nature-printed illustrations. When I had completed the collection of grasses which formed the basis of the illustrations herein published, Mr. Duthie did me the kindness to identify and name them for me. So far as scientific nomenclature and classification goes, therefore, this collection owes its completeness almost entirely to that gentleman's kind assistance and published work.

Of late years the grasses have acquired a new economic importance to Government in connection with their cultivation on the grass farms started by the Military Department at Allahabad and Cawnpore for the supply of grasses to cavalry regiments. These experiments are thus referred to by Professor Robert Wallace, of Edinburgh, who visited these farms in 1887, and whose competence as a critic renders his opinion the more important:—

'The experiments on the cultivation of grass land, which have been carried out on the Government grass farms at Allahabad and Cawnpur, have shown that wonderful results can be achieved in this direction, and that these results are possible without incurring additional expenditure. In short, grass-growing has been made a paying speculation while yet no regular system of management existed. This is a good indication that there is a source of revenue waiting to be developed by the skilful cultivation of grass on waste lands when the proper course to follow in the management . . . is discovered and fully made known.'[3]

The Grass Farm at Allahabad is thus described by Professor Wallace:—

'The Allahabad Grass Farm, which now extends to 4600 acres, was instituted, in 1882, by the late Major-General Sir Herbert Macpherson, in compliance with the desire of his Excellency the Commander-in-Chief. The object was to provide a larger and better supply of fodder for the animals in the military service. It has not only come up to anticipation in this respect, but it has proved to be a successful financial speculation, in spite of the fact that experience had to be bought often at a high price, on account of the unskilled management which at first it was impossible to avoid. The estimated profit over the whole for crop 1887 was Rs. 20,000.

[1] *On Laying down Land to Permanent Grass.* By C. Faunce De Laune. Journal of the Royal Agricultural Society of England, vol. xviii. 1882.

[2] *The Fodder Grasses of Northern India*, by J. F. Duthie, B.A., F.L.S., Director, Botanical Department of Northern India: Roorkee, 1888.

[3] *India in* 1887, as seen by Robert Wallace, Professor of Agriculture and Rural Economy in the University of Edinburgh: pp. 284, 285. Oliver and Boyd: Edinburgh, 1888.

'Some of the manured land which I examined yielded 500 maunds, or nearly 19 tons of green grass per acre—in spite of the fact that the growing season was a short one, owing to the rains being unusually curtailed. The yield from some of the land treated in an ordinary way averaged about 150 maunds, or nearly 6 tons per acre.

'Besides about 2000 tons of green grass issued during the season, 1000 tons of hay and considerably over 1000 tons of silage have been stored for future use.

'India ought to possess many more such farms. The unquestionable success of this initial effort at Allahabad leaves no ground of excuse for the delay in establishing them at practically all centres where considerable numbers of Government animals are kept. Not only would they save Government money, but they would serve as practical examples, gradually coming into requisition, of a form of cultivation (that of grass) which is practically unknown to the ryot, because it is not necessary for him to follow it until the pressure of population encroaches upon the common grazing grounds. This pressure of population, which is the great incentive to progressive movements on the part of ruling authorities in India, will sooner or later make it necessary for Government to procure fodder in some other way than by the practice of sending grass-cutters, under an order which practically amounts to this: "Get grass honestly if you can, but get it!" The system is not a satisfactory one. . . . We know, as a matter of fact, that cutters do not confine themselves to such areas, from the maimed and injured condition in which they frequently return to camp after having been found deliberately stealing.*

* 'A pamphlet by Major Yahlwyn and Sergeant Meagher states that the supplies coming from the Grass Farm "prevent constant complaints which arise from the men encroaching on the land of the ryot."'[1]

The practice of Ensilage has been introduced to a limited extent in India, and may be said to be still on its trial. The native farmers have not, however, adopted it, nor will they do so till European example has convinced them by long-continued demonstration that it is a profitable arrangement, and not too troublesome. When, and if, this *is* proved to their satisfaction, it promises to be a useful means of storing up fodder which would otherwise be wasted. Professor Wallace considers that ensilage may be specially suitable for India. He says:—

'If silage is ever to be effectually established on a large scale for the benefit of a great community, it will be in India. Although I am no advocate of the general adoption under all circumstances of systems of ensilage in this country, yet I believe the adverse climatic conditions met with in our Eastern Empire are such as could be overcome in a marked degree by making silage on an extensive scale. Modern inventions and recent experience have produced methods by which ensilage can now be practised at a merely nominal expenditure of capital. It is not necessary to build an expensive house or silo. It is even unnecessary to dig a hole in the ground to contain it. All that is required is to build the grass into a good large stack on the surface of the earth, and tie it down tightly with galvanized steel-wire rope. . . .'[2]

'To sum up, I believe India is the great field for the development of ensilage. Though bad results have followed in some instances—through ignorance and unskilled management—enough successful work has been done to show that the very best silage can be made when the efforts are properly directed. The conditions of the climate are such that, by depending upon the ordinary methods of preserving the abundant natural supply of fodder in a dry condition, much loss is entailed. And again, no country in the world is reduced at times to greater straits in the matter of supply of food for man and beast. The moisture contained in the food substance I believe to be a decided advantage in an Indian climate. There is nothing in the surroundings which will prevent the contents of a silo from keeping in good condition in India quite as long and quite as well as at home. I heard of numerous successful results from silos which had remained fifteen months before being opened.'[3]

As before said, the natural grass crop in this region owes its great value and importance to the fact that the country is largely pastoral, and for months in the year the cattle to a great extent are entirely dependent on the produce of the uncultivated grass lands.

The breed of cattle of these regions is famous, and no finer bullocks are to be found in the north of India—or perhaps in the world—than those which have been reared on the Government Cattle Farm at Hissár. The cows of the Hariána tract, known in the north of India as Hauri cows (from the town which was, before British occupation, the capital of the district), are celebrated as good milkers. In the Hissár Farm breeds of cattle of all parts of India are reared and crossed. Among the most useful strains are those of Mysore (the Mysore bullock is an active and compact animal), of Gujrat, and of Bikáner, whence come the famous Nagauri bullocks, standing 13 or 14 hands high.

The area is very liable to famines, or at least seasons of scarcity—more so than most other tracts of the north of India; and the mitigation of distress at such times by attention to fodder supply is one of the practical questions which has recently engaged the attention of the Agricultural Department of the Government of India.

That this is an eminently practical question appears from the fact that where the rainfall seriously fails—a not unfrequent occurrence—the loss of cattle is enormous. I find that General

[1] *India in* 1887, *etc.* pp. 286-288. [2] *Ibid.* p. 289. [3] *Ibid.* pp. 292, 293.

MacMahon, then Commissioner of the Hissár Division, estimated the loss of cattle during the cold season of 1877 as follows:—

Bullocks,	died, ...	118,416
Cows,	,, ...	131,926
Buffaloes,	,, ...	44,895
Camels,	,, ...	10,978
Calves, male,	,, ...	81,075
Calves, female,	,, ...	25,479
Sheep and Goats,	,, ...	68,242

Well might the Commissioner remark that the loss to the people was enormous, and that it would be some years before they recovered these losses of stock. How important in such a region become such questions as grass-farming, stacking, ensilage, arboriculture, and the supply of arboreal fodder, is easily imagined.

In order to give an idea of the effect which a dry season, but not characterised by any great severity of drought, has on the cattle of this region, I will here quote an official account of the agricultural condition of the Hissár District from the beginning of March to the end of August 1884:—

'Except in canal villages, and in those in the neighbourhood of the Ghaggar, there was little or no grazing till near the end of June. In the beginning of June, in Fatehábád the condition of the cattle was fair; in Hissár proper, better; but in Hánsi, Bhewáni, and Barwála, especially Barwála, very bad. Deaths of cattle from starvation, however, did not occur till the beginning of May. Thenceforward till the middle of June there was a marked increase; after June the numbers began diminishing. The deaths of cattle were as follows:—May, 1026; June, 2525; July, 514; August, 30. . . . In Barwála and Hánsi, and in Bhewáni also, large numbers of cattle were sent away for grazing to favourably situated villages inhabited by relations, or to canal villages. Numbers were sent to Patiála and Bikáner;[1] and a few to the grazing grounds in the Terai. By the end of March, indeed, the greater part of the cattle of Barwála Perganah had been thus dispersed to other parts of the country. The Hissár spring cattle fair ended on the 29th March. Large numbers of cattle were brought for sale, but buyers were scarce, and prices ranged very low. Many of the poorer people, however, were thus enabled to dispose of cattle they could no longer maintain. From the beginning of July the condition of cattle began steadily to improve, and green pasturage was to be had in abundance.'

Stacking is practised to a large extent, and the stalks of sorghum and millet keep good in stack for years. Wild grasses, however,—(there are no lands *cultivated* with grass)—have as yet been stacked by the natives only to a very limited extent. I reported to Government in 1884 that the subject of the storage of grass in the shape of hay has received very little attention from the Zemindar, and he seldom makes a hay stack. If he does, he usually puts Dúb (*Cynodon dactylon*) in it. A grass stack is called 'Bágar.' The theory and practice of grass-stacking in that part has got to be studied in all its branches. A beginning, however—and a very successful one—has already been made by the officers in charge of the Farm at Hissár, who have been very successful in keeping large supplies of green fodder in stack. Some of the stacks which were used in 1884 were five or six, and even, I think, some as much as seven or eight, years old. My own inquiries led me to the conclusion that, if thoroughly protected from the wet, grass will last in stack a very long period—for ten, twelve, or perhaps even twenty years. It seems, in fact, when properly dried and protected, to be nearly imperishable.

Captain Marrett, in charge of the Hissár Farm, informed me that about twenty maunds or 1600 lbs. of hay (quite uncultivated) could be cut per acre from the best parts of the *Bir* or grass lands. The same area, if cultivated with sorghum, would give, besides grain, some sixty maunds, or 4800 lbs., of dry stalk or straw. Grass properly stacked at the right time, Captain Marrett states, will last seven years. This period, judging from other information I received, is under-estimated.

[1] The jungles of the native States of Patiála and Bikáner yield fodder even in dry seasons, because their vast extent leaves them comparatively ungrazed.

Mr. Ogilvie, Deputy Commissioner of Hissár, reports as follows regarding the practice of hay-making by the natives:—

'Hay is made in the month of October, but only when the autumn rains have been plentiful, and in favourably situated localities. The canal-irrigated villages often possess too small an extent of pasture land to admit of hay being stored in any quantity. In unirrigated villages, as a rule, no attempt is made to reserve any part of the pasture lands for the production of hay, but if the grass has been luxuriant, there is generally a portion remaining untouched by cattle when the hay season arrives. Hay is stored in ricks, and if these are well made, the hay will last in an edible state for about eight years.'

My inquiries in Hissár led me to believe that some of the best grasses for stacking are:—

Anjan *or* Dháman,	*Cenchrus montanus* or *Pennisetum cenchroides.*
Dúb,	*Cynodon dactylon.*
Palwa,	*Andropogon pertusus.*
Kheo,	*Sporobolus orientalis.*
Sarwála,	*Heteropogon contortus.*
Sín *or* Sewan,	*Elionurus hirsutus.*

The following grasses do not seem to bear stacking well:—

Ghantil,	*Eleusine flagellifera.*
Bhobra,	„ *Scindica.*

Regarding the stacking qualities of Sánwak (*Panicum colonum*), and Kuri (*Panicum helopus*), I have received contradictory accounts.

The question of the improvement of fodder grasses, by such means as special cultivation and selection of seed, has not yet been approached for these regions, so far as I know; and I knew them intimately four years ago. Grass is never, in fact, sown or cultivated by the native farmers at all. There are no meadow pastures. All the grass fodder that is consumed is what grows spontaneously, and it often grows in great luxuriance in the uncultivated areas.

Experience has already shown how much capacity for resisting the effects of drought—as far as the cattle are concerned—the people have at their command. In past times the great mortality among cattle has been largely due to the want of energy and forethought on the part of the husbandmen. There is no reason why even a succession of two or three bad crops should be seriously destructive of cattle. Careful husbandmen, such as those of the Jat tribe and the Bishnois, do not allow their cattle to die. They have the opportunity in good or fair seasons to lay up stores of fodder which last for years, and the writer has seen stacks of 'karwi,' or sorghum stalks[1] (cultivated crop), support the cattle unscathed in the villages of prudent cultivators in a dry season. The remark of Sir Alfred Lyall, in a recent minute on the Revenue Administration of the North-West Provinces, holds good for the region we are considering. He says: '*A large number of cattle die every year because their owners take no trouble to find food for them.*' In the natural grass crop, the surplus of which could be stored in ordinary and abundant seasons, the farmers have at hand a most powerful means of resistance to the calamity of drought.

In June 1884, after I had witnessed the miserable condition of the cattle in the Jhajjar Tehsil, I mentioned to a Jat farmer in another part of the country how the cattle were dying there. He replied that if he were farming in Jhajjar he would not let his cattle die in that manner: '*At least,*' said he, '*I would die first myself.*'

[1] It is said that sorghum 'karwi' (dried stalks) will last in stack for ten years, while the Bajra 'karwi' (*Pennisetum typhoideum*) will last even twenty years. The stacks of 'karwi' are thatched over with *Panni* grass (*Andropogon muricatus*). 'Mot' bhusa will last in a small stack ('kupp') ten or twelve years. 'Channah' bhusa will last, it is said, eight to twenty years in stack. The thatch of a stack must, it is said, be renewed after two years, if there has been heavy rain.

The Pachádas and Rángars, Mohammedan tribes of the Hissár country, are improvident, and they are tempted to sell off their small stocks of fodder when it becomes dear in a season of drought, and so their cattle suffer.

The Tahsíldár (native revenue officer) of Hánsi, who had been sixteen years in the district of Hissár, said to me that by provident arrangements Zemindars could save their bullocks through *three* bad years, but they would die the fourth year. He admitted, however, he had never seen four bad seasons consecutively in Hissár. He thus admitted that he had never seen circumstances where great mortality of cattle was really unavoidable. He added that even the Jats could make more of their resources if they chose. Similarly, another Tahsíldár (of Barwála) said to me that the villagers had told him that they could keep their own cattle for ten years (of bad seasons), but they sold their fodder stores to turn an honest penny. '*It is only the idle*,' said this Tahsíldár, '*who cannot make their own arrangements to save their cattle.* Bágris' (Hindu cultivators who live in the Bágar Des, or tract to the west of Hissár, extending towards Bikáner), he said, '*would not feel a famine if it lasted five or seven years!*'

From another point of view the importance of studying and increasing the Grass supply of India had been pointed out by Professor Wallace. He says:—

'I look upon the possibility of enormously increasing, by the use of proper methods, the grass production of India as one of the most important of the means available to Government in the future for averting the impending evil of an over-crowded population. Not only will the increased grass supply be a direct benefit to the live stock of the country, but every extra ton of grass grown also induces greater fertility in the soil, in virtue of the accumulation in it of an additional amount of crop residue.'[1]

The collection now published does not profess to be a complete one even for the Hissár District. The method of its formation and its object have been rather practical than scientific. The short descriptive accounts of the qualities of each species have been based upon personal inquiries from the natives of Hissár, upon notices of the various species collected from official reports of officers who have conducted the Land Settlements of neighbouring districts, and of others. No doubt some common and important species find no place in the following pages; *e.g. Eragrostis cynosuroides* (Dáb), *Saccharum ciliare* (Múnj), *Saccharum spontaneum* (Sarkanda); but these are not grasses specially useful for fodder, as they are large and coarse; and it is probable that this Collection contains all or most of the grasses most useful as fodder.

I have already acknowledged the assistance in nomenclature so kindly given me by Mr. Duthie. I have made frequent reference to the published reports of the following officers:—Messrs. O'Brien, Purser, Steedman, Francis Fanshawe, Wilson, all of the Bengal Civil Service; and Captain Wingate, Deputy Assistant Commissary-General, whose efforts in grass farming have been so successful, and who possesses extensive practical knowledge of the subject. I have also to acknowledge information kindly furnished to me by Mr. E. B. Francis, C.S.

To my printers, Messrs. T. and A. Constable, my cordial thanks are due for the ready help afforded me in getting the Illustrations executed in a style which I venture to think alike creditable to the artist who copied them from my dried specimens, and to the lithographer. And I gratefully acknowledge the kindness and courtesy of my valued friend Mr. Archibald Constable, which has rendered easy the somewhat difficult task of carrying a work of this nature through the press while I have been absent in India.

In the revision of the work for the press, the arrangement of the descriptive letterpress, and the preparation of Indices, I have been materially aided by the kind assistance of Dr. W. P. Dickson, of Lahore.

[1] *India in* 1887, *etc.*, p. 293.

In spelling the native names of grasses and places, I have adhered to the well-known Jonesian or Hunterian system, in which the vowel-sounds are as follows :—

a has the sound of the short *u* in *fun*
á has the sound of *a* in *far*
e „ *ey* „ *grey*
i „ *i* „ *police*
í „ *ee* „ *peer*
o „ *o* „ *bone*
u „ *u* „ *bull*
ú „ *u* „ *pure*
ai „ *y* „ *lyre*
n with dot below it has a nasal sound.

W. COLDSTREAM.

SIMLA, 1888.

ERRATA.

Page 4, *for* Hauri *read* Hánsi.

PLATE II., fifth line, new sentence should begin at 'called.'

PLATE X., *for* Cenchrus montanus *read* Pennisetum cenchroides.

PLATE XVI., *for* Panjabis and Pachadas *read* Panjábis and Pachádas.

PLATE XVII., *for* 'Kallan' *read* 'Kallar' soil.

PLATES XX. and XXXI., *for* Gurdarpur *read* Gurdáspur.

PLATE XXIII., *for* Lámh *read* Lamb.

PLATE XXXI., *for* Madhanah *read* Madhánah.

PLATE XXXII., *for* (apparently by mistake) *read* (by mistake?).

PLATE XXXVI., *for* Punch *read* Púnch.

Throughout *for* Dhaman *read* Dhámar, *for* Sín *read* Sín, *for* Therna and Jharna *read* Jherna.

PLATE I.

No. 1.

SERIES A.—Panicaceæ. TRIBE I.—Paniceæ.

PANICUM ANTIDOTALE.

Retz.

Native name 'GHIRRI.'

Name not known to the Zamindárs. Is not counted a grass. Seems to be an unripe form of No. 1*a* (*Ghamúr*).

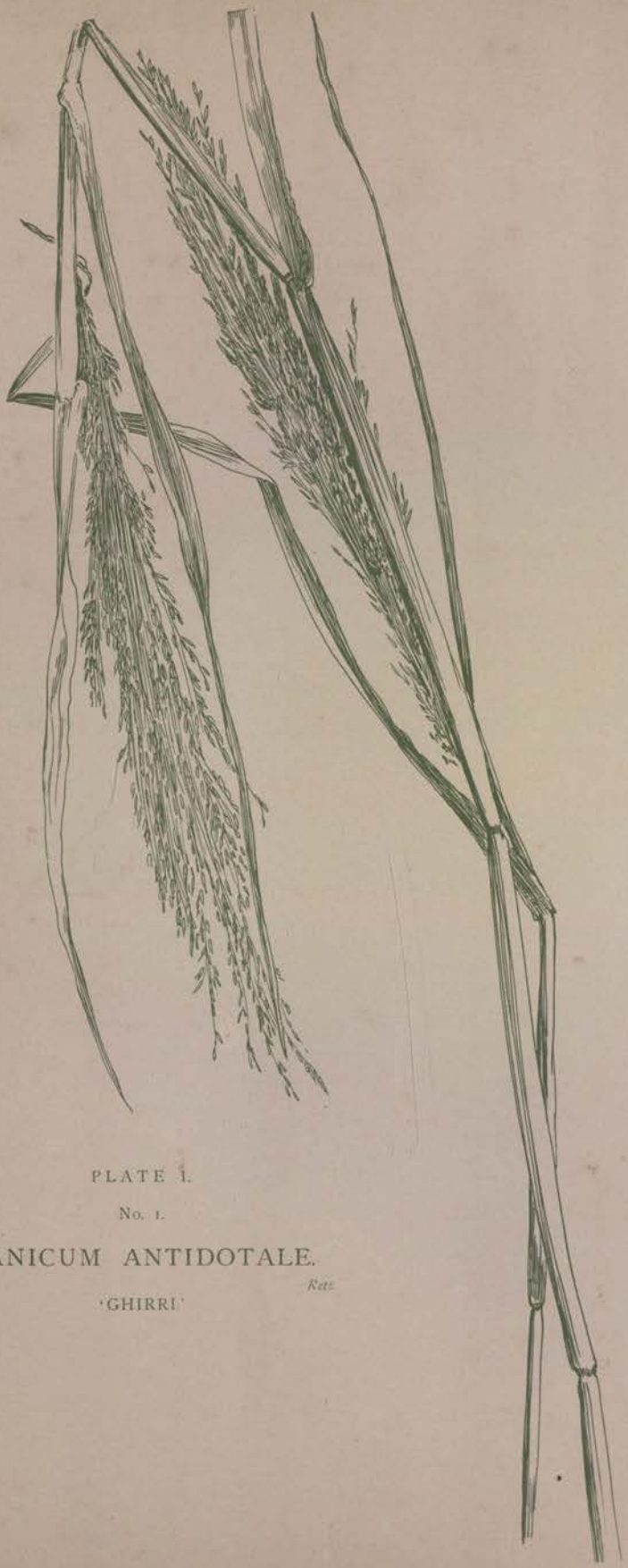

PLATE I.

No. 1.

PANICUM ANTIDOTALE.

Retz.

'GHIRRI'

PLATE Ia.

No. 1*a*.

PANICUM ANTIDOTALE.

Retz.

Native name 'GHAMÚR.'

Not considered useful. Has a bitter or saltish taste. Not much grazed,—only when tender. Is not stacked. Not very abundant. Grows in rich soil at roots of caper (*Karil*) bushes, and in hedges. Called in North-West Provinces *Ghamúr*, and also *Garham*. In Jhang it is not found in Kallar soil, but usually under bushes and where dung has fallen, and is considered inferior in quality (Steedman).

Purser says, 'Garham' is a 'tall coarse grass with a woody stem which is often found growing round a "Karil" bush. Goats and camels are said not to eat it. It is an inferior grass.' It is also called Garham in Ferozepore.

PLATE Ia.

No. 1a.

PANICUM ANTIDOTALE.

Retz.

'GHAMÚR.'

PLATE II.

No. 2.

PANICUM COLONUM.

Linn.

Native name 'SÁMAK.'

Its grain is sold in the bazar. It is boiled with rice and made into *Khir*. Is very good as green forage: may be stacked: and said to remain good in the stack five or six years.

Wilson (Sirsa Settlement Report) notes that in Sirsa it is sometimes made into bread, called also *Sánwak* and *Sawánk*.

'The wild Sawánk,' says Purser, 'is a good grass. It fattens and brings cattle into condition soon. The grain is small, and eaten by Hindus on Fast-days. It is also used by poor people made into paste, called Bát or "Phāt" and eaten with milk or butter-milk. It grows in firm soil.' Makes good silage and grows very quickly (Wingate).

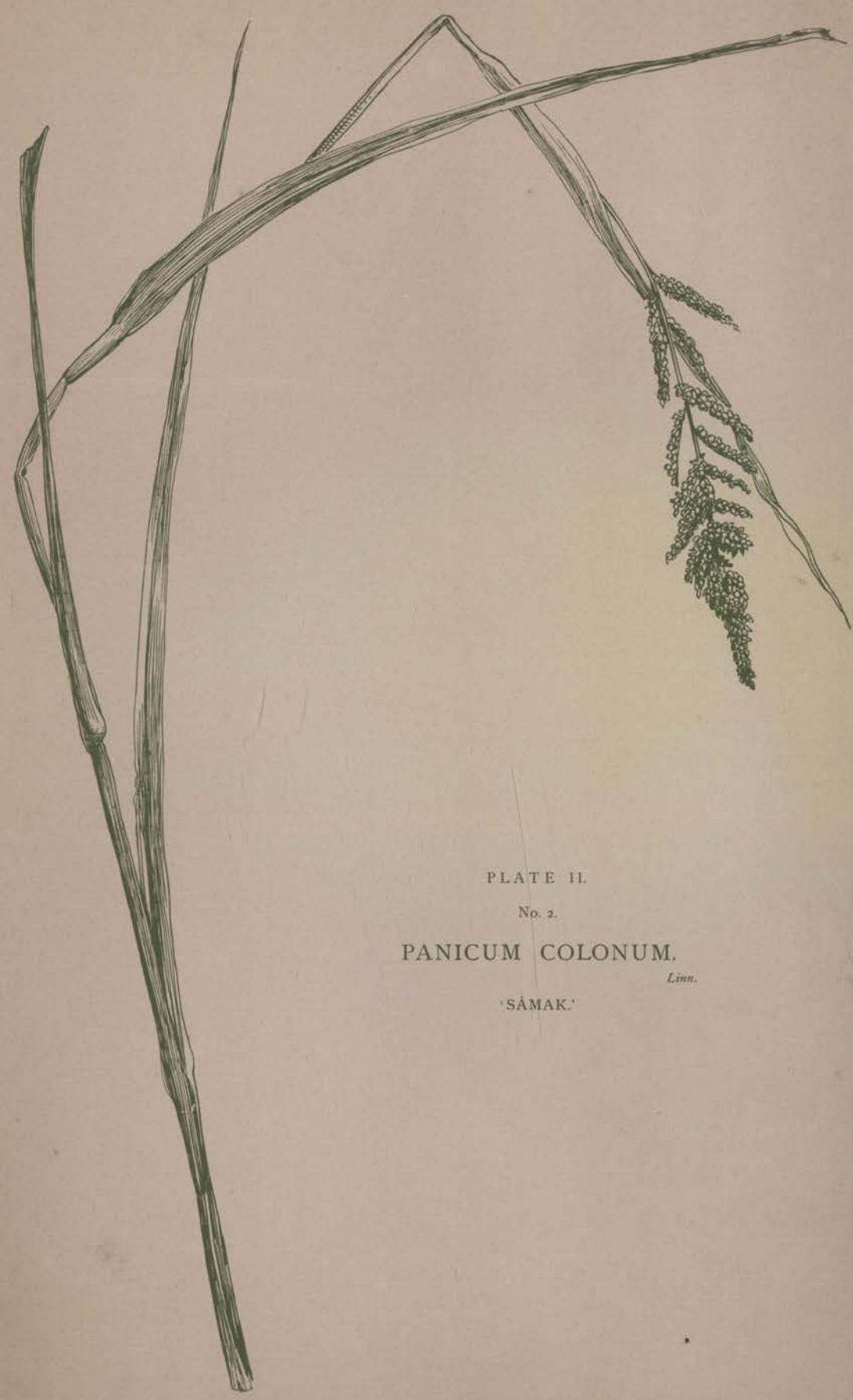

PLATE II.

No. 2.

PANICUM COLONUM.

Linn.

'SÁMAK.'

PLATE III.

No. 3.

PANICUM CRUS-GALLI.

Linn.

Native name 'BHARTI.'

Grows in moist soils. People eat its seeds. Hindus boil it with rice to make '*Khir*' on Fast-days. Not abundant. 'Makes good silage and grows very quickly (Wingate).

PLATE III.

No. 3.

PANICUM CRUS-GALLI.

Linn.

'BHARTI.'

PLATE IV.

No. 4.

PANICUM MILIARE

Lamk.

OR

P. PSILOPODIUM.

Trin.

Native name 'CHIN.'

Abundant; very good for grazing; grows in fields; not common in jungle; will also stack, it is said.

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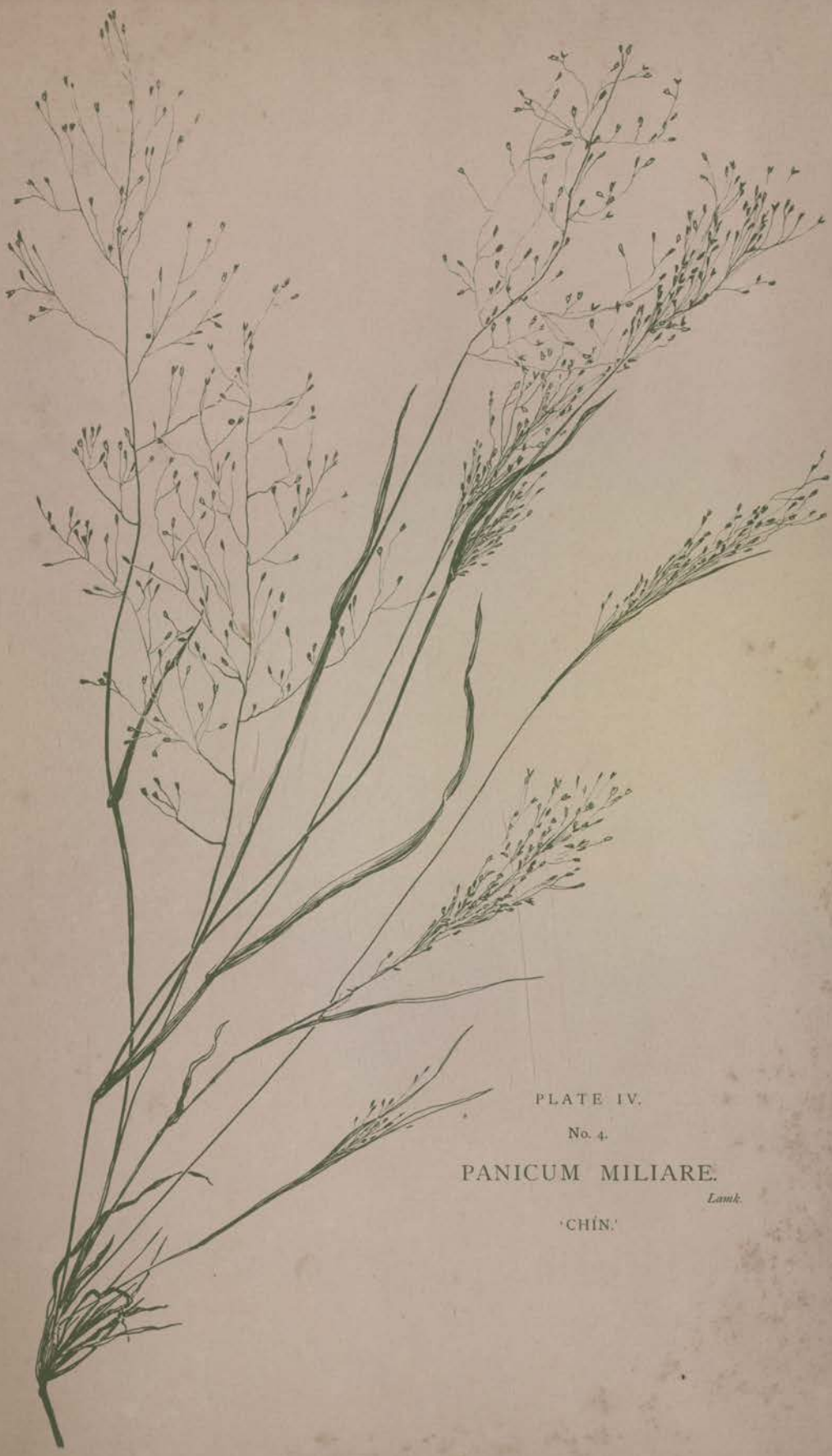

PLATE IV.

No. 4.

PANICUM MILIARE.

Lamk.

'CHÍN.'

PLATE V.

No. 5.

PANICUM HELOPUS.

Trin.

Native name 'KÚRI.'

Is good for grazing, also for stacking, but is not abundant. Will last, it is said, six or seven years in stack. Is mostly found in cultivated lands. This is probably the grass which in Jhang is called *Kūriya*.

Mr. Steedman says, '*Kuriya* is uncommon. It is a first-class grass. Horses do particularly well on it.'

Makes good silage and grows very quickly (Wingate). Duthie says the grain is eaten by the people.

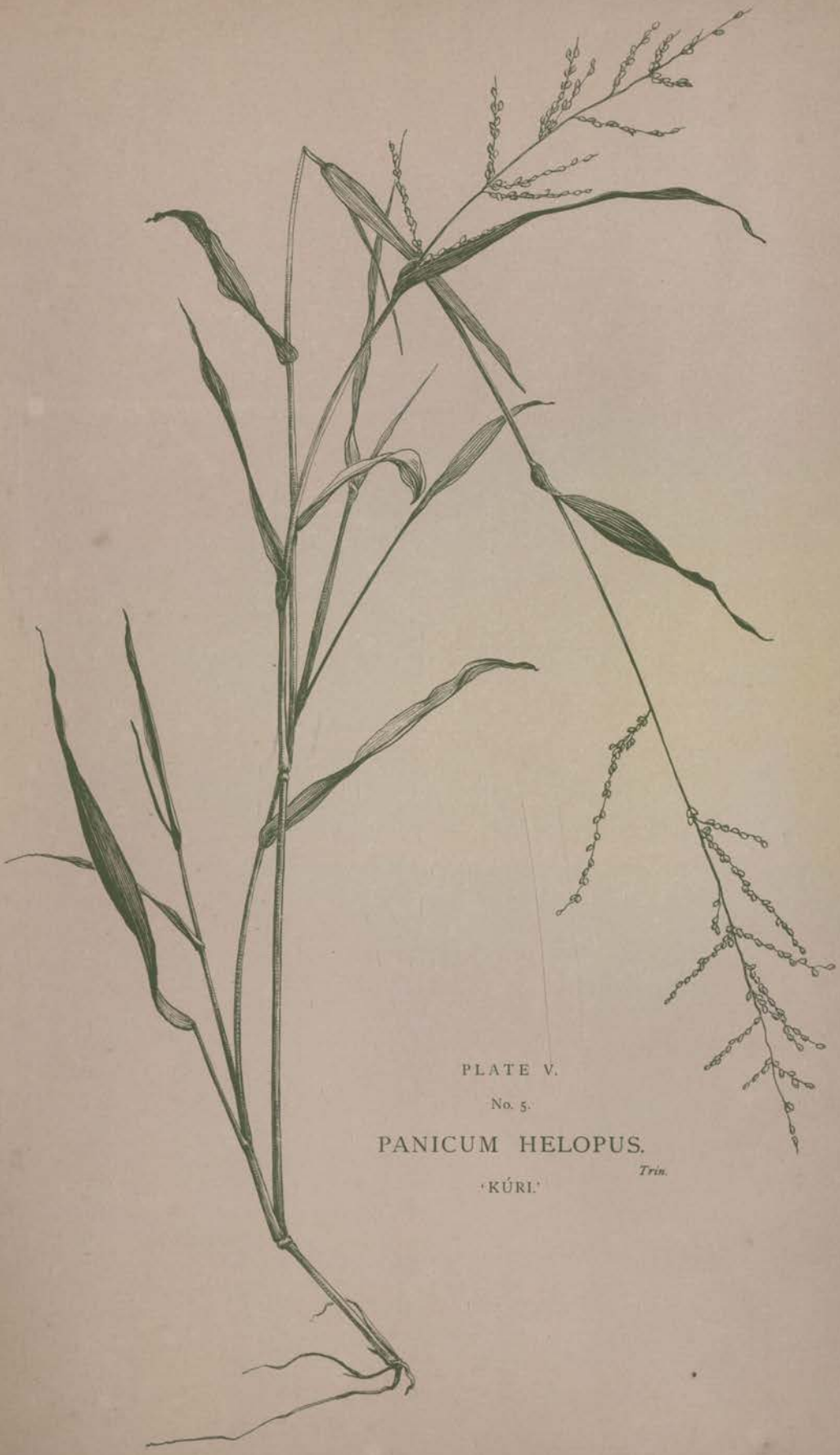

PLATE V.

No. 5.

PANICUM HELOPUS.

Trin.

'KÚRI.'

PLATE VI.

No. 6.

PANICUM SANGUINALE.

Linn.

VAR. Ciliare.

Native name 'BARA TAKRIÀ.'

Good for grazing and stacking. Not abundant. It is said to last in stack seven or eight years. 'Makes good silage and grows very quickly; called also "Siuri." Horses thrive as well on it as they do on *Dáb* (*Cynodon dactylon*). An excellent grass, but cannot be cultivated largely, as it is not a rooty grass' (Wingate).

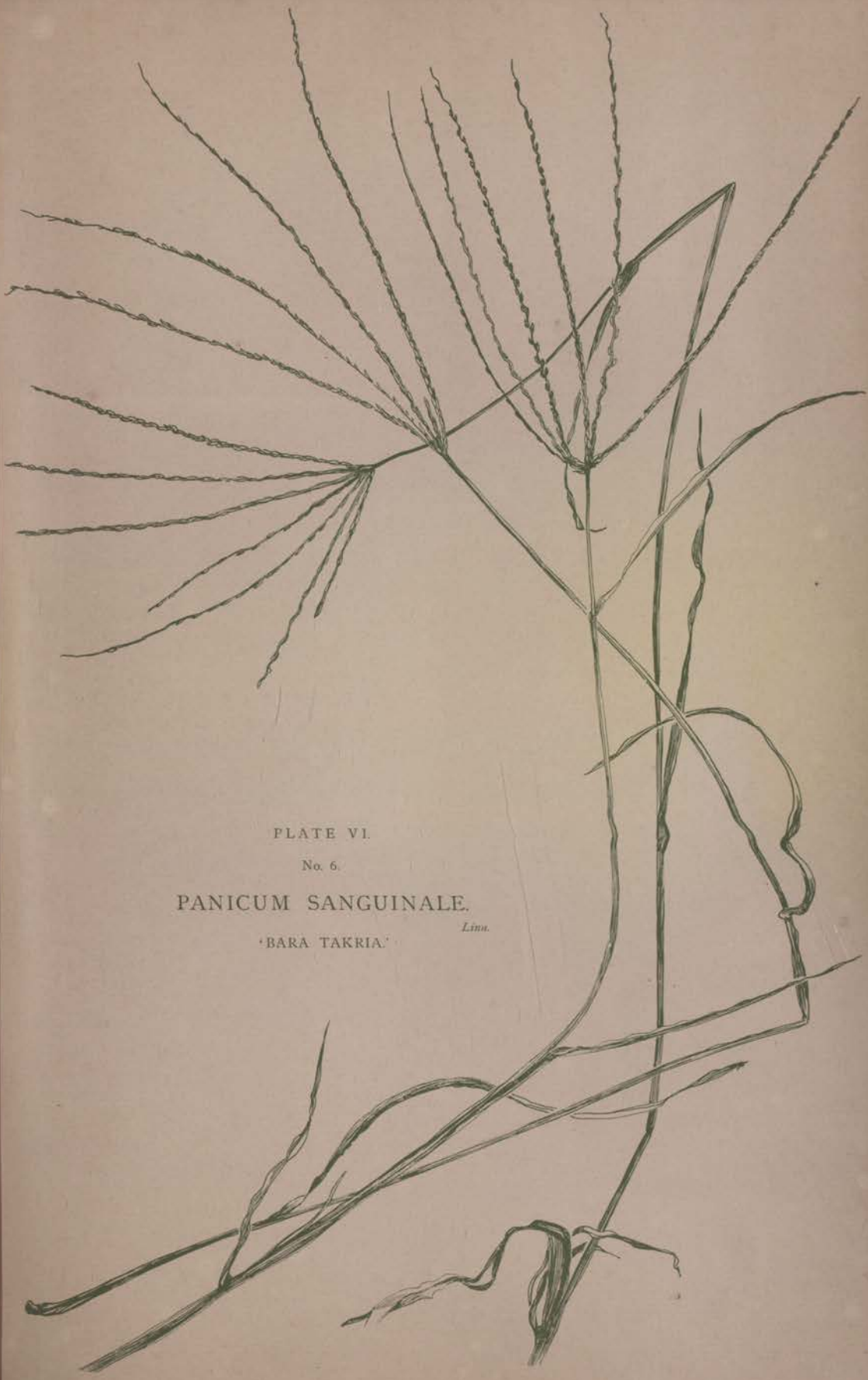

PLATE VI.

No. 6.

PANICUM SANGUINALE.

Linn.

'BARA TAKRIA.'

PLATE VII.

No. 7.

SETARIA GLAUCA.

Beauv.

Not known as a grass by the Zamindárs. Must be scarce and of little value. Said to grow by water-courses.

PLATE VII.

No. 7.

SETARIA GLAUCA.

PLATE VIII.

No. 8.

SETARIA VERTICILLATA.

Beauv.

Native name 'CHIRCHIRA.'

Not reckoned among the useful grasses. One of the grasses which grows near the Canal.

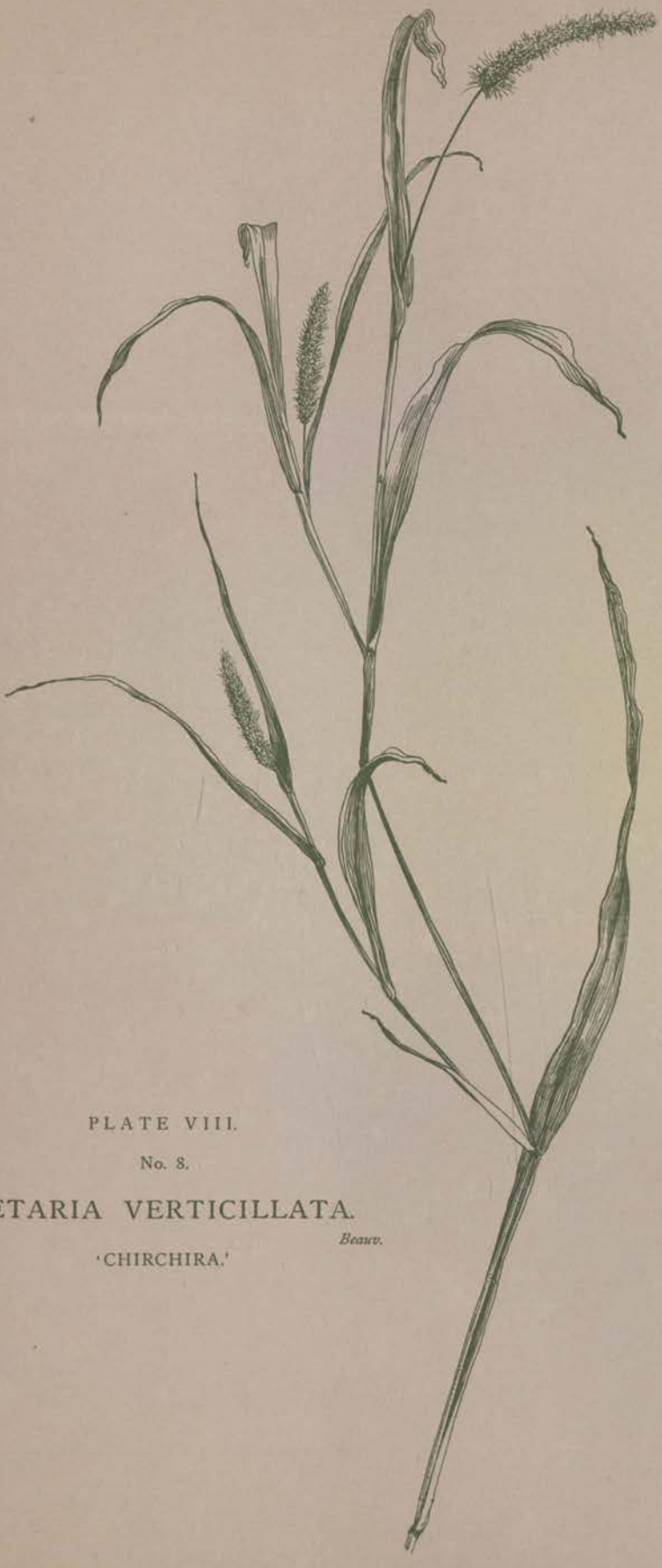

PLATE VIII.

No. 8.

SETARIA VERTICILLATA.

Beauv.

'CHIRCHIRA.'

PLATE IX.

No. 9.

CENCHRUS CATHARTICUS.

Del.

Native name 'BHURAT.'

Mr. E. B. Francis, C.S., states that the Zamindárs at Ferozepore have a proverb about this grass—

'Gah ná
Gáh jehá'—

'Not a grass, but like one.' In that district it is called *Aleha* or *Leha*.

When tender, much grazed; not good for stacking: is the grass (with *Barú* and *Sewan*) characteristic of the *Bágar Des*, or tract to the south of Hissar and Sirsa. The seeds adhering to garments are the torment of travellers. 'The seed of this grass is collected and mixed with bájra flour, and in this form is much used by the poorer classes' (Tod's *Rajasthan*). Wilson states that it is common in poor sandy soil. He relates that the Bagris tell how an Emperor of Delhi was on his way with an army to attack Bikánir when a *Bhurat* seed stuck in his arm; he picked it off, and it stuck in his finger; he tried to bite it off, and it stuck in his lip and gave him great pain. When told the country was full of these things he did not venture further, and Bikánir was saved from invasion.

PLATE IX.

No. 9.

CENCHRUS CATHARTICUS.

Del.

'BHURAT.'

PLATE X.

No. 10.

CENCHRUS MONTANUS.

Nees.

Native names 'DHAMAN' AND 'ANJAN.'

See No. 11. There seems to be some confusion either in my original specimens or in the native names. I believe the Plates are now correctly named. This also, as well as *Cenchrus montanus*, is called *Dhaman* (Punjab) or *Anjan*. Both names are applied to both the grasses: one white and downy-looking; (*Pennisetum?*) the other darker and more compressed. Duthie says the grain is eaten by the people.

PLATE X.

No. 10.

CENCHRUS MONTANUS.

Nees.

'DHAMAN' AND 'ANJAN.'

PLATE XI.

No. 11.

PENNISETUM CENCHROIDES.

Rich.

Native names 'DHAMAN' AND 'ANJAN.'

See No. 10. There seems to be some confusion either in my original specimens or the native names. It is said that the *Pennisetum cenchroides* (?) is black when unripe and white when it comes to maturity. One of the most nutritious of grasses; said to be the very best; very abundant. Said to last in stack fourteen or fifteen years, or practically for any period, if kept dry. If the owner of a fat bullock or buffalo is asked, 'Where did you raise that fat animal?' the answer will probably be, 'Oh! I fed it on *Dhaman*,' at such and such a place. *Dhaman* is in this sense equivalent to the English clover.

Wilson in his Settlement Report of Sirsa says: 'It is common in the pasture grounds of Bikanir, but was one of the first grasses to give way before the plough, as it grew on the best lands, which were first brought under cultivation; is now somewhat rare.' 'For horses as nutritious as Dūb' (Wingate).

'*Dhaman*,' says Steedman in his Settlement Report of Jhang, 'is the best of all grasses. It is found in the largest quantities in the north of the District; to the south it is rare. When riding through the *bár* I met with only a few plants. It requires a good soil, and will not grow in Kallar soil. The Zemindárs complain that the *Dhaman* is becoming scarcer and scarcer, and attribute the scarcity to the great failure of the rains during the late years. I do not think this idea is correct. It is a thick juicy pale green grass, and grows to a considerable height in favourable grass. This grass, the Zemindárs believe, if in good condition gives a semi-intoxicating effect to the milk of buffaloes who graze on it.'

Horses will not eat it, as it is bitter (Purser).

PLATE XI.

No. 11.

PENNISETUM CENCHROIDES.

Rich.

'DHAMAN' AND 'ANJAN.'

PLATE XII.

No. 12.

Tribe V.—Zoysieæ.

TRAGUS RACEMOSA.

Hall.

Native name 'BHARCHINTI CHHOTI.'

Common in the Hissar Bir and in cultivated land. Is too small to stack (like Lámp, *Aristida depressa*), but is a very nutritious grass. Much grazed in the rains.

PLATE XII.

No. 12.

TRAGUS RACEMOSA.

Hall.

'BHARCHINTI CHHOTI.'

PLATE XIII.

No. 13.

Tribe VI.—Andropogoneæ.

ELIONURUS HIRSUTUS.

Munro.

Native name 'SIN.'

Pronounced at Hissar with the *i* very long. In Bágar and Bikaner called *Sewan* or *Shewan*.

Nutritious, and good for grazing, and probably for stacking; not stacked in Hissar, where it is not so plentiful. In Bágar (where only this grass and *Bur* and *Bhurat* and *Barú* are common) it is said to be stacked, and is supposed to last in stack ten years. It is sweet when young; when mature it gets very hard. Weavers make their brushes (called *Kúnch*) of its root.

'The seed of this grass is collected, and, mixed with bajra flour, enters much into the food of the people of Bikanir' (Tod's *Rajasthan*). It is a rapid grower; and in Bikaner is said to grow high with a single fall of rain. The elephants in Bikaner are fed on it. The wilds of Bikaner owe their usefulness as a grazing ground in seasons of drought to the abundance of this grass, along with the few others above mentioned, and *Dhaman*. In Bikaner it is commonest in the Tehsils of Nauhar, Bhatner, Suratgarh, and Anupgarh. This is said to be the grass classically known as the *Cusa*, and is said to have originated the name of Cush, the second son of Rama, and his race, the Cushwáha (or Kachwáha).

'It is often eight feet in height. When young it serves as a provender for animals; and when more mature as thatch for huts; while its roots supply a fibre, converted by the weavers into brushes, indispensable for their trade' (Tod's *Rajasthan*, ii. 286).

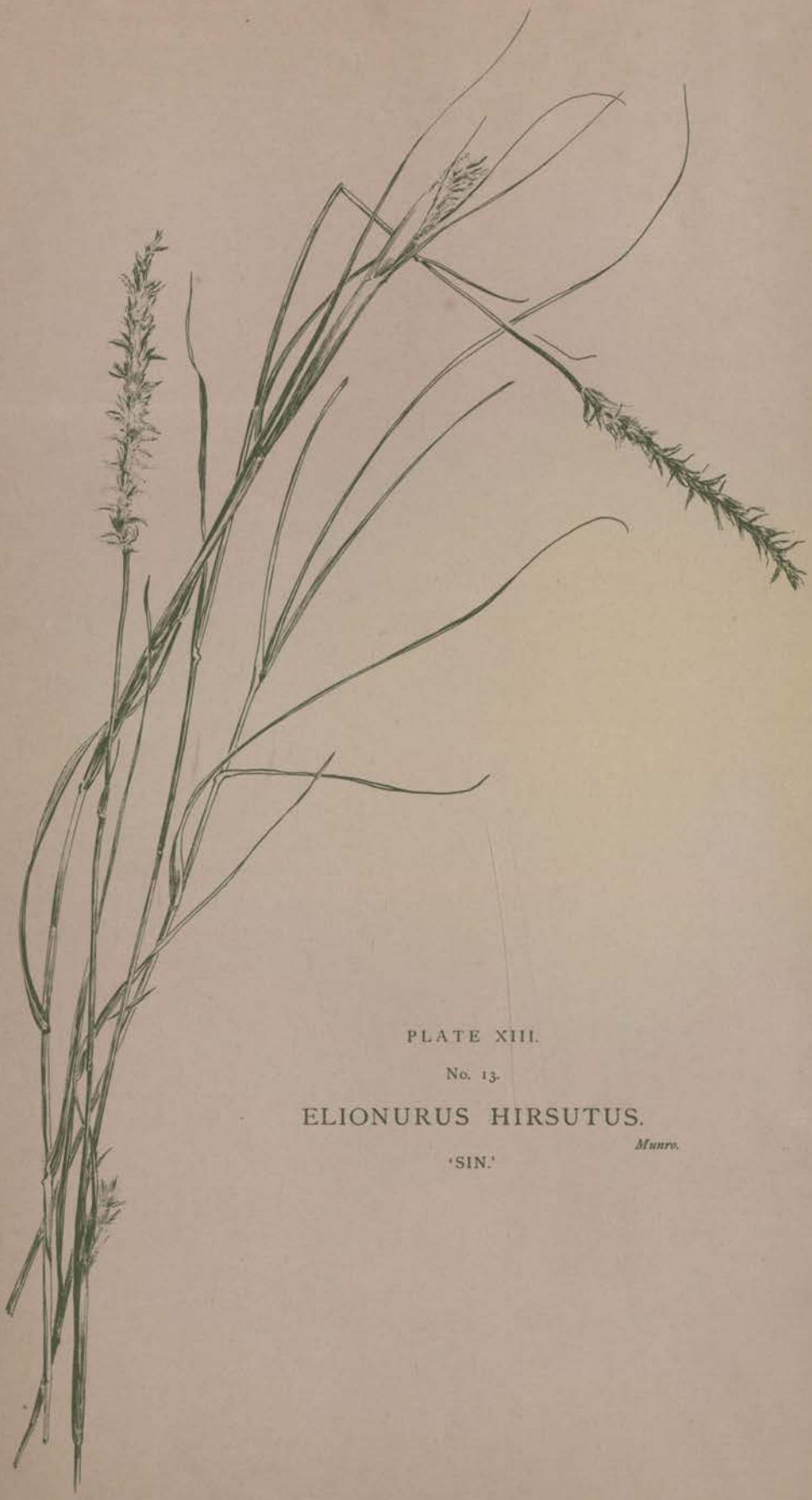

PLATE XIII.

No. 13.

ELIONURUS HIRSUTUS.

Munro.

'SIN.'

PLATE XIV.

No. 14.

MANISURIS GRANULARIS.

Szwartz.

Not much relished by cattle. Both grazed and stacked, but opinions differ as to its qualities. Supposed to last five or six years in stack.

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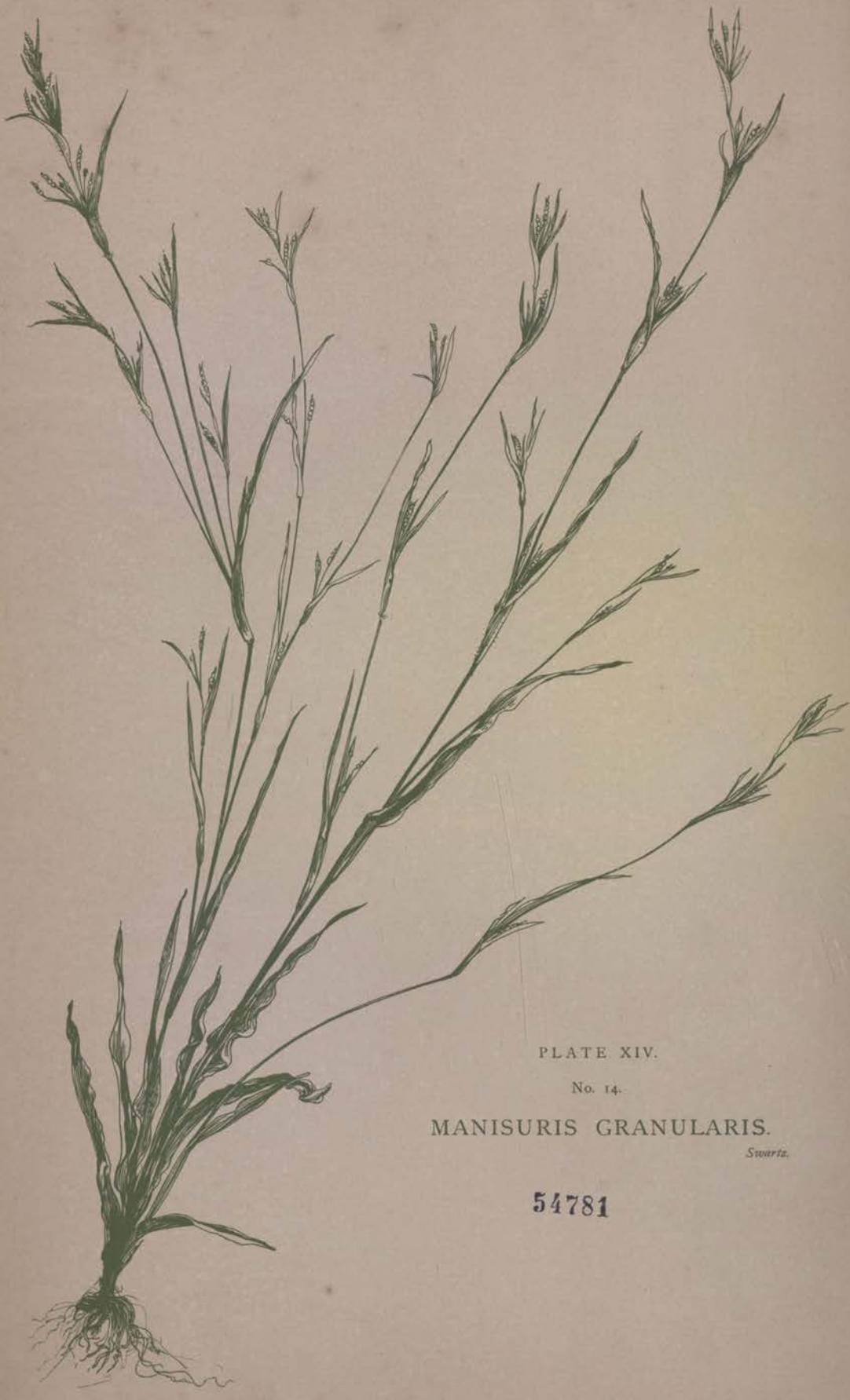

PLATE XIV.

No. 14.

MANISURIS GRANULARIS.

Swartz.

54781

PLATE XV.

No. 15.

ANDROPOGON FOVEOLATUS.

Del.

Native name 'GHIRJI.'

Not well known as a grass by the Zamindárs. Must be scarce and of little value.

PLATE XV.

No. 15.

ANDROPOGON FOVEOLATUS.

Del.

'GHIRJI.'

PLATE XVI.

No. 16.

ANDROPOGON LANIGER.

Desf.

Native name 'BÜR.'

Very common in the Hissar Bir; a jungle grass; does not grow about cultivated lands. Is grazed when tender; but not when full-grown. But is stacked, and is then useful in times of scarcity. Is said to last ten to twelve years in stack. A great deal of this is stacked at the Hissar Farm. It is common in Bikaner. It is a fragrant grass, and when cattle have eaten much of it their milk is scented with it. The Panjabis and Pachadas call it *Khawi*. Wilson says it is also called *Khoi* in the Sirsa District. Considered as a most nutritious grass. Wilson notes that 'its red colour, when ripe, gives a tinge to the general landscape where it abounds.' There are said to be two kinds of it, a white and a red. The *Rauns* (see No. 17) has a similar characteristic, and it is very like this grass.

In Ferozepore grows only in the most sandy country; not considered valuable (Francis).

PLATE XVI.

No. 16.

ANDROPOGON LANIGER.

Desf.

'BÚR.'

PLATE XVII.

No. 17.

ANDROPOGON SCHŒNANTHUS.

Linn.

Native name 'RAUNS,' *and* BUJ *in Hissar.*

Not very good for grazing. Grows in swamps; not very abundant; a tall grass; used for thatches and screens (*tattis*). Captain Marrett informed me it was one of the best grasses for cattle on the Hissar Farm; and that it stacked well. Fragrant. Gives gripes to horses; very common in Naini Tal.

Seems to be called *Khawi* in the North-West Provinces, and in Mozuffergurh *Khâwi*. *Khawi* is found in the Thall (sandy desert tract), and has a faint lemon smell (O'Brien).

In Jhang the *Khawi* is one of the grasses of the Bar. It is used there to grow in hollows where water collects, and seems to prefer 'Kallan.' There is any quantity of it round Toba Tek Singh. It has a peculiar fragrant smell, and is of a dark brownish red colour. Cows graze upon it if hard pressed, but not otherwise. It contains little nutrition. The Bar housewives use wisps of this grass to clean out vessels used for churning or holding milk (Steedman). '*Khawi*,' says Purser, 'grows about two feet high in clumps, often in hard low-lying lands. But it is plentiful in the Bar, along the Montgomery and Dipalpur road. The flowers are fluffy. When ripe the plant is of a brownish red colour. It is a fragrant grass, and a scent is said to be made of it. The milk of cattle eating it is supposed to become perfumed.'

I have some doubt, however, as to the identity of Steedman and Purser's *Khawi* with *Andropogon schœnanthus*, called also *Bharwi*, in the North-West Provinces. Not suitable for hay on account of its coarseness (Wingate).

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PLATE XVII.

No. 17.

ANDROPOGON SCHŒNANTHUS.

Linn.

'RAUNS.'

PLATE XVIII.

No. 18.

ANDROPOGON MURICATUS.

Retz.

Native name 'PANNI.'

Principally used for thatching; not grazed except when young and tender; not considered a 'grass' by the Zamindárs; and only given to cattle in seasons of excessive drought.

In Kaithal and Pihowa, and other places where the grass is abundant, cattle will eat the young shoots in the month of March ('Chait'), when the old stalks have been burned off to allow the new shoots to sprout.

They did this in Tehsil Futtahabad when it was abundant there, but now the land has been too much broken up for cultivation.

Its root is the scented *Khaskhas*, which is used for *tattis*—or grass screens which are kept wetted to cool rooms. Has a wonderfully spreading root, very difficult to eradicate.

Wilson, in his Settlement Report of Sirsa District, states that 'the villagers dig up the roots, sometimes paying the owner of the ground four annas per digger for the right to dig; and that the roots are sold for about one rupee per maund (80 pounds) to the traders, who send them to Lahore and Ferozepore' (pp. 14, 15).

In Jhang it is said by Mr. Steedman to grow in hollows and depressions, but to select only the best soils. It is never seen in 'Kallar.' Its roots are very long and tough, and they are also used for ropes, and for the brushes used by weavers for arranging the threads of the web.

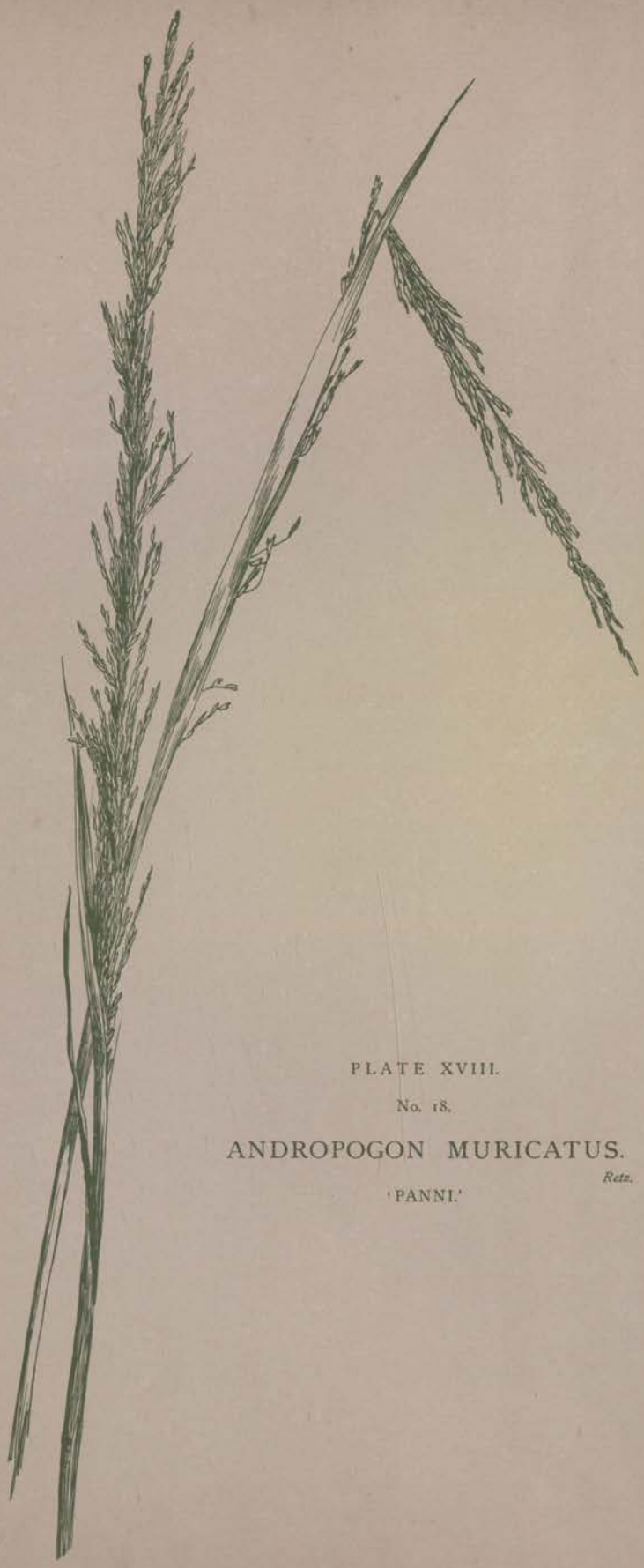

PLATE XVIII.

No. 18.

ANDROPOGON MURICATUS.

Retz.

'PANNI.'

PLATE XIX.

No. 19.

ANDROPOGON PERTUSUS.

Willd.

Native name 'PALWA.'

Abundant in Hissar Bir; good for grazing; especially grazed by buffaloes (Fanshawe).

Said to remain in stack twelve or thirteen years. Therefore deemed one of the stacking grasses.

Much stacked on the Hissar Farm. *Phalwán* in Jhang, which is very probably this grass, is said to make excellent sweet hay, not so fragrant or tender as English hay, still not to be despised.

'In Montgomery the *Phalwán* is usually found in good soil, and is by some considered the best of all the grasses' (Purser).

Called also *Jargi* in the North-West Provinces. For horses as nutritious as *Dúb* (Wingate).

PLATE XIX.

No. 19.

ANDROPOGON PERTUSUS. *Willd.*

'PALWA.'

PLATE XX.

No. 20.

SORGHUM HALEPENSE.

Pers.

Native name 'BARÚ.'

If this grass is grazed when quite young, say six inches to one foot high, before the flower has developed, and when it is suffering from drought (*awar ka mara hua*), it is said to be sometimes poisonous, and to be fatal to cattle. The remedy is said to be to push the animal into a pond. It is common about cultivated lands, in fields, also in the jungles; grows in both soft and hard lands (locally called *Bur* and *Rohi*). Grazed much, and is relished as sweet; is also stacked to a certain extent. Said to remain good in stack five years. Is a short-lived grass, and when dry speedily decays.

'The seed of this grass is collected, and, mixed with bajra flour, enters much into the food of the poorer classes in Bikaner' (Tod's *Rajasthan*, ii. p. 170).

In America it is said to thrive well as a pasture grass, and to resist drought. It is said to quickly fill the ground, and to be exceedingly difficult to eradicate.

It should never be planted where it is intended afterwards to cultivate.

The acting Commissioner of the Agriculture Department of State Washington says: 'Some plantations of Johnson's Grass (this is the name it is known by in America) are more valuable, acre for acre, than the best cotton land. One bushel of seed (28 pounds) is sufficient for an acre. On good soil it yields from two to three tons per acre, and can be cut three times during the summer in the Gulf States.' (Quoted in *Indian Agriculturist*, June 25, 1887.)

This grass is said in Gurdarpur District to be good for horses.

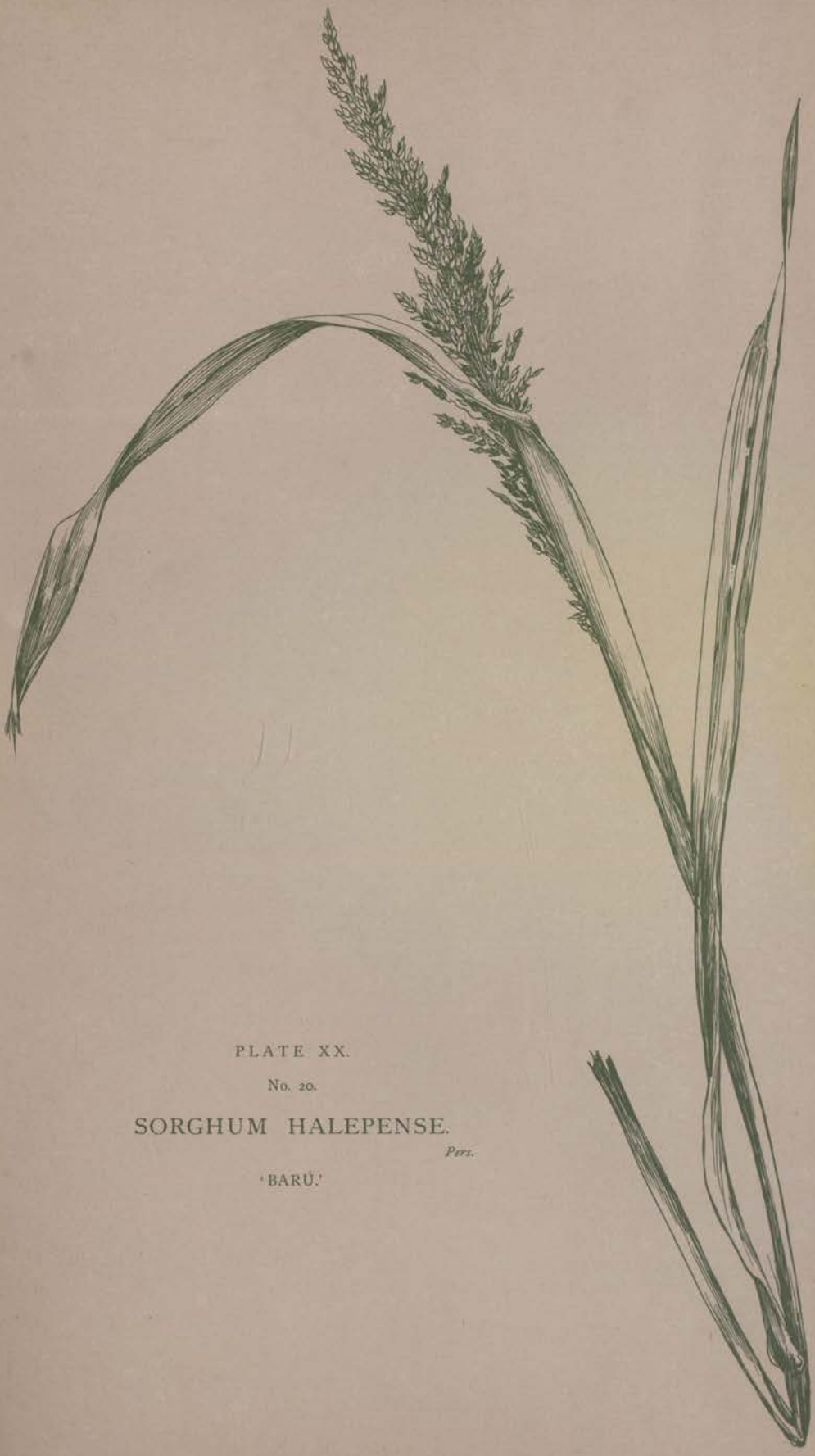

PLATE XX.

No. 20.

SORGHUM HALEPENSE.

Pers.

'BARÚ.'

PLATE XXI.

No. 21.

ISEILEMA LAXUM.

Hack.

Native name 'GÀNDI.'

Both grazed and stacked. Is fragrant when green. Grows in swamps, and is much eaten by buffaloes. Said to last ten or twelve years in stack. Very common in the swamps of Hissar Bir, in good land along with *Sámak*. Where this grass grows wheat will grow; will not grow in the poorer soils, such as 'Bur' or 'Kallar.'

For horses as nutritious as Dúb (Wingate).

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

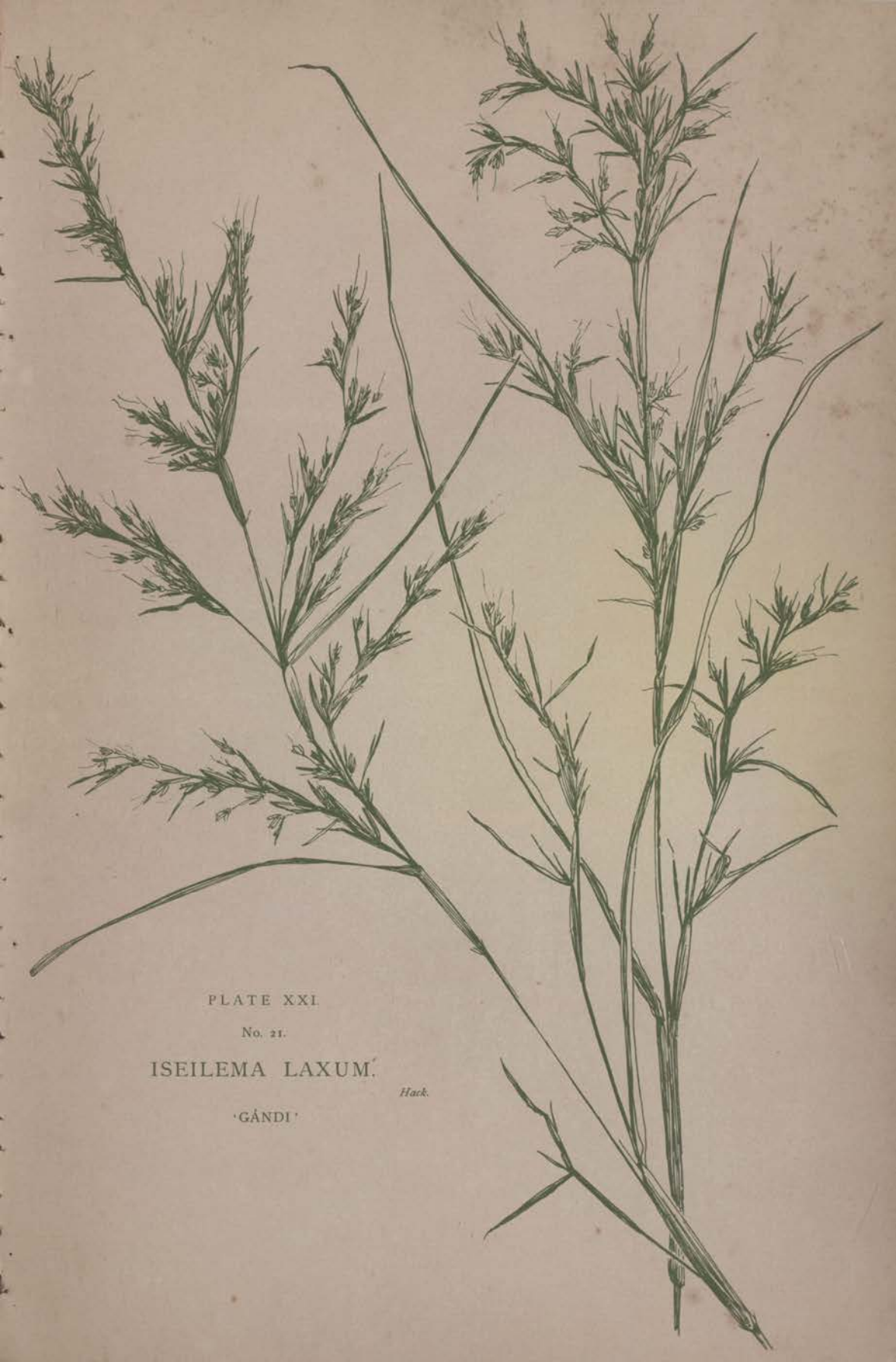

PLATE XXI.

No. 21.

ISEILEMA LAXUM.

Hack.

'GÁNDI'

PLATE XXII.

No. 22.

HETEROPOGON CONTORTUS.

(SPEAR GRASS.)

R. and S.

Native name 'SÁRWALA' OR 'SÚRWALA.

Is grazed when tender, but when full-grown refused on account of its barbed seeds. Common in the damp grounds ('Dábar'). A jungle grass, not frequenting cultivated lands; is found in same places as *Bur*.

Is stacked at the Hissar Farm, and said to keep good in stack for twelve years.

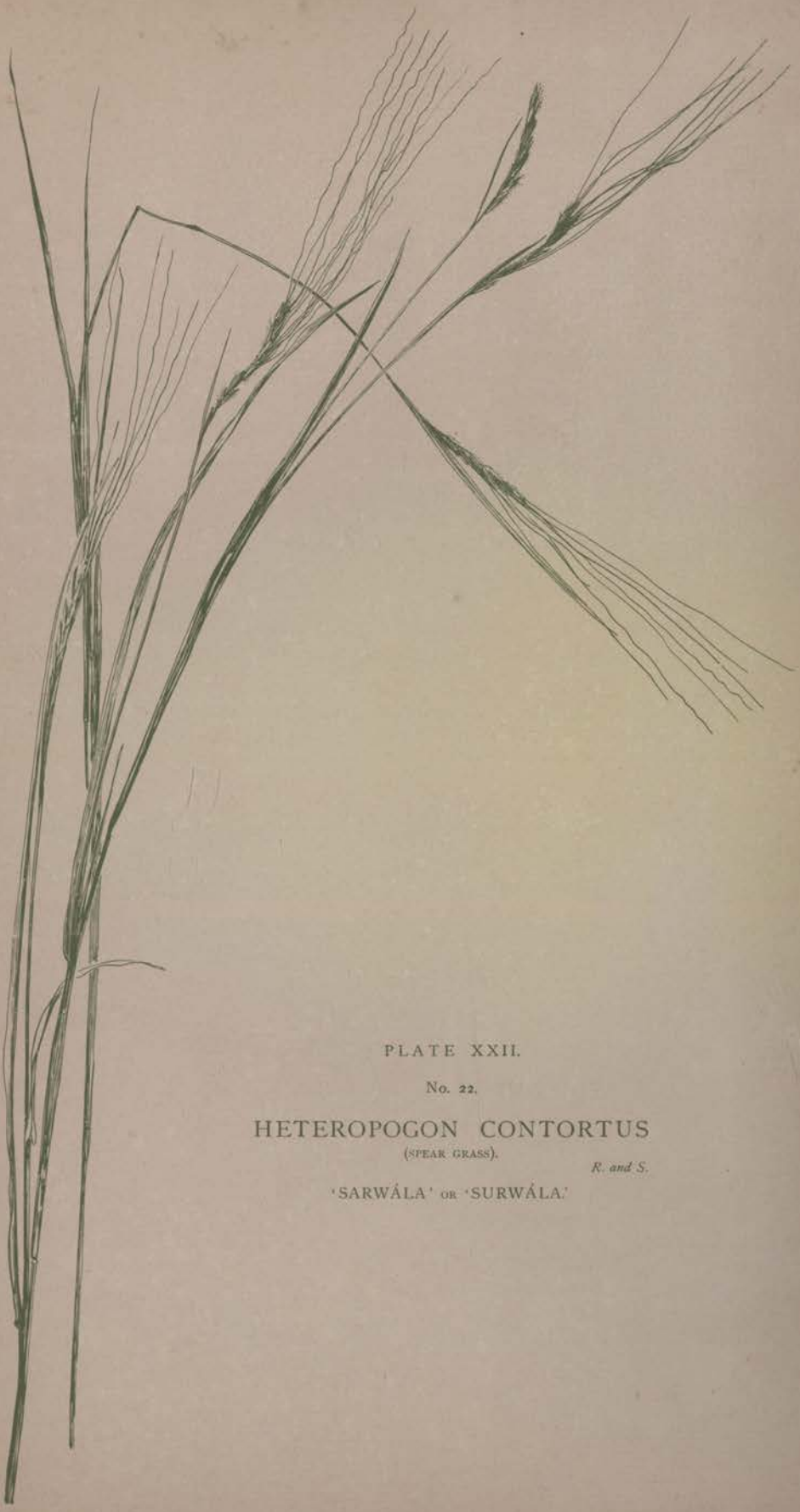

PLATE XXII.

No. 22.

HETEROPOGON CONTORTUS

(SPEAR GRASS).

R. and S.

'SARWÁLA' OR 'SURWÁLA.'

PLATE XXIII.

No. 23.

Tribe VIII.—Agrostideæ.

ARISTIDA DEPRESSA.

Retz.

Native name 'LAMP.'

Is grazed ; too short and light to stack ; covers the Hissar Bir in vast sheets ; cannot be cut with a scythe, as it is too fine and soft. It is particularly relished by cattle, and nutritious, when it has been wetted by winter's rain.

Also called in the North-West Provinces *Lámh.*

In Mozuffergarh, says Mr. Steedman, *Lam* is a feathery grass of average quality, and is found growing in 'Kallar.'

Lamh, says Purser, is produced when there is heavy rain. It is eaten by cattle, and when green increases the yield of milk and butter. Called also *Laphia* in the North-West Provinces (Wingate). Said by Wingate to be not suitable for hay on account of its coarseness. He adds that it contains very fine spears, and as it is difficult to make hay of it before the spears form, it is best to silo it (Wingate).

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

PLATE XXIII.

No. 23.

ARISTIDA DEPRESSA.

Retz.

'LAMP.'

PLATE XXIV.

No. 24.

SPOROBOLUS DIANDER.

Beauv.

Native name 'HARNAK.'

Not uncommon, but name not known to the native cultivators at Hissar, who were familiar with the other species of grasses.

PLATE XXIV.

No. 24.

SPOROBOLUS DIANDER.

Beauv.

'HARNÅK.'

PLATE XXV.

No. 25.

SPOROBOLUS ORIENTALIS.

Kunth.

Native name 'KHEO.'

Good for grazing. Said to last in stack fourteen or fifteen years. Particularly good for *horses*.

The *Kei* or *Keo* of Jhang, which is very probably this grass, is remarkable for the speed with which it springs up after rain. This grass is called in the North-West Provinces *Palanji* or *Usar ki ghás*.

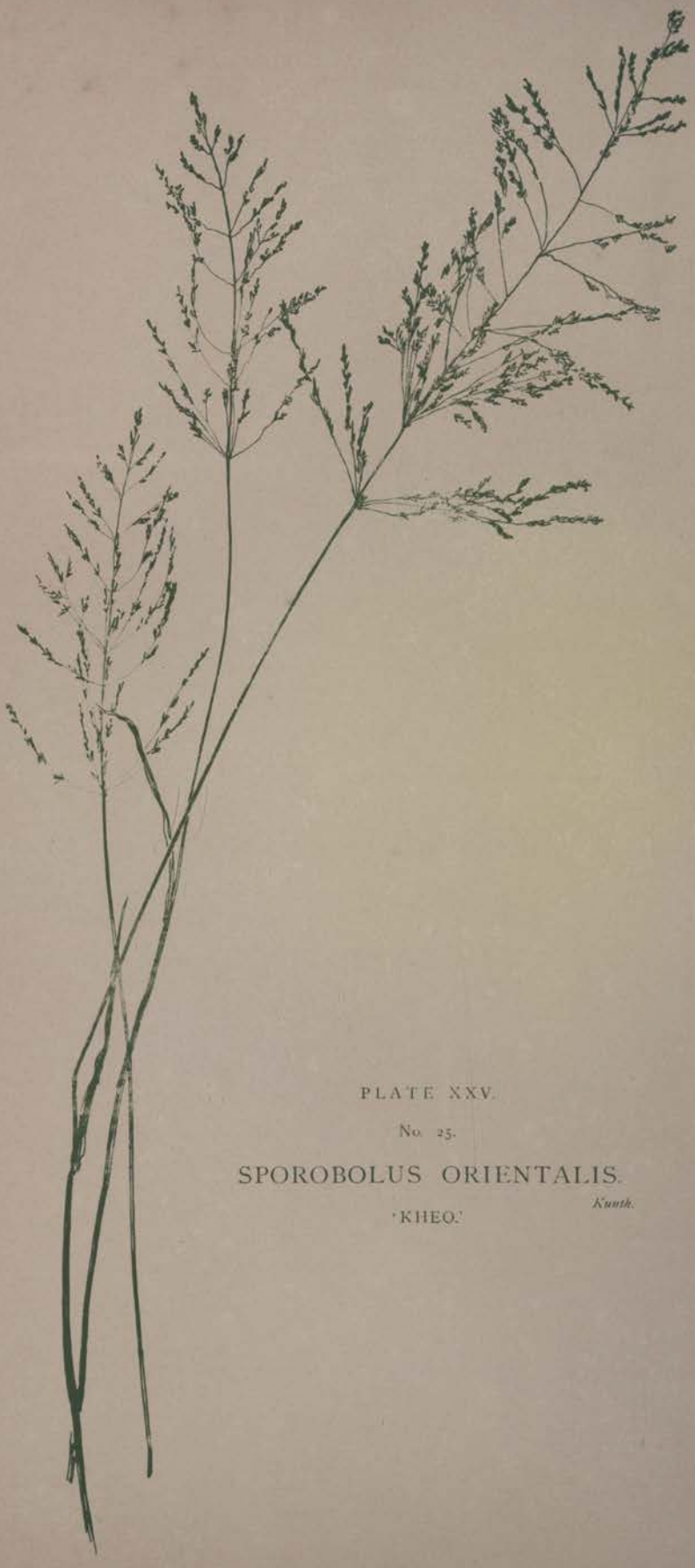

PLATE XXV.

No. 25.

SPOROBOLUS ORIENTALIS. *Kunth.*

'KHEO.'

PLATE XXVI.

No. 26.

SPOROBOLUS PALLIDUS.

Lind.

Native name 'PALINJI.'

Considered as of no use as a grass to the Zamindárs. Seeds eaten by people in seasons of famine (Fanshawe).

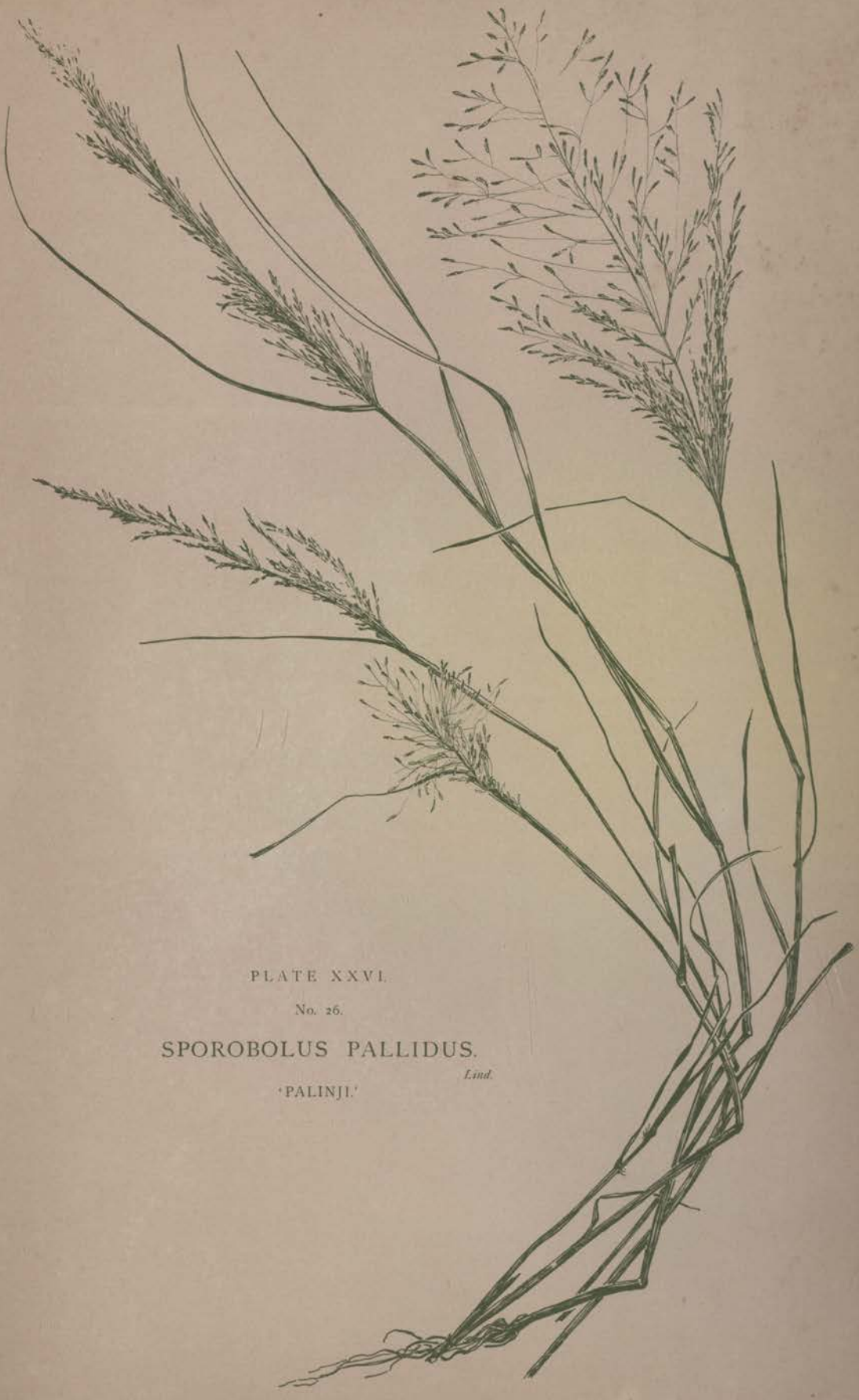

PLATE XXVI.

No. 26.

SPOROBOLUS PALLIDUS.

Lind.

'PALINJI.'

PLATE XXVII.

No. 27.

Tribe X.—Chlorideæ.

CYNODON DACTYLON.

Pers.

Native name 'DÚB.'

Called in the Panjab *Tilla*, and also *Khabbal*.

Very nutritious grazing for cattle and horses. Also stacked. Will last ten years; very abundant, principally about cultivation. This grass is the one principally stubbed up for horses. It is also stacked; it is occasionally stacked by the Zamindárs, who however do not stack grass as a rule. '*Aur ghás jal jáegi, Dub rahegi khúb*'—'Though all other grasses be burned up, the Dub will remain fresh' (Fanshawe's Settlement Report, Rohtak District).

It is called *Tala* in Mozuffergarh and *Tola* in Montgomery; is a sign of good soil (O'Brien; Purser).

Is said to be bitter during the early part of the Monsoon (Wingate).

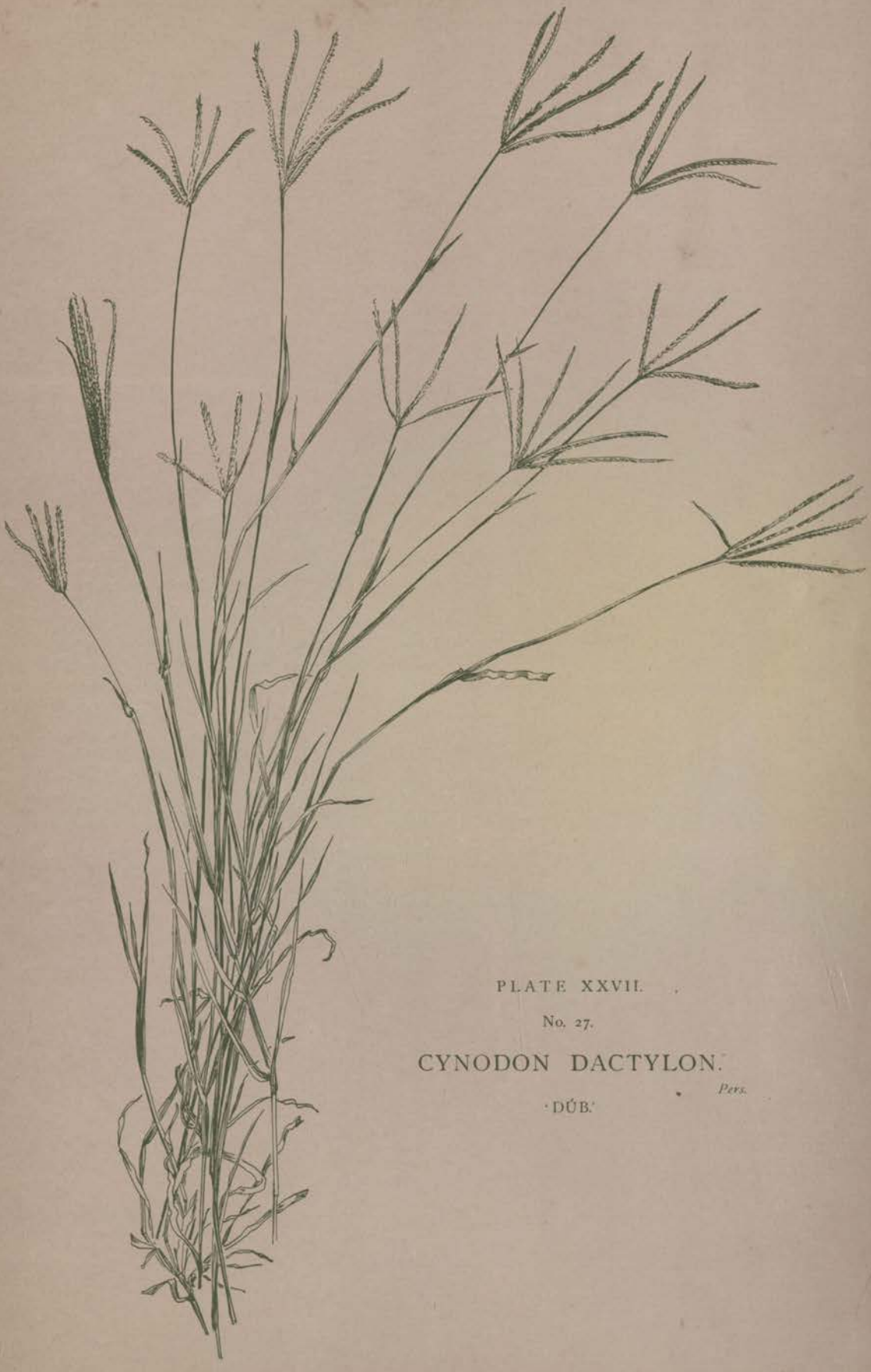

PLATE XXVII.

No. 27.

CYNODON DACTYLON.

Pers.

·DÚB.·

PLATE XXVIII.

No. 28.

CHLORIS BARBATA.

Swartz.

Native name 'CHHOTA TAKRIA.'

Not abundant in Hissar Bir; is not much grazed; common about cultivated lands; probably not much of it is stacked. Will last four or five years only in stack.

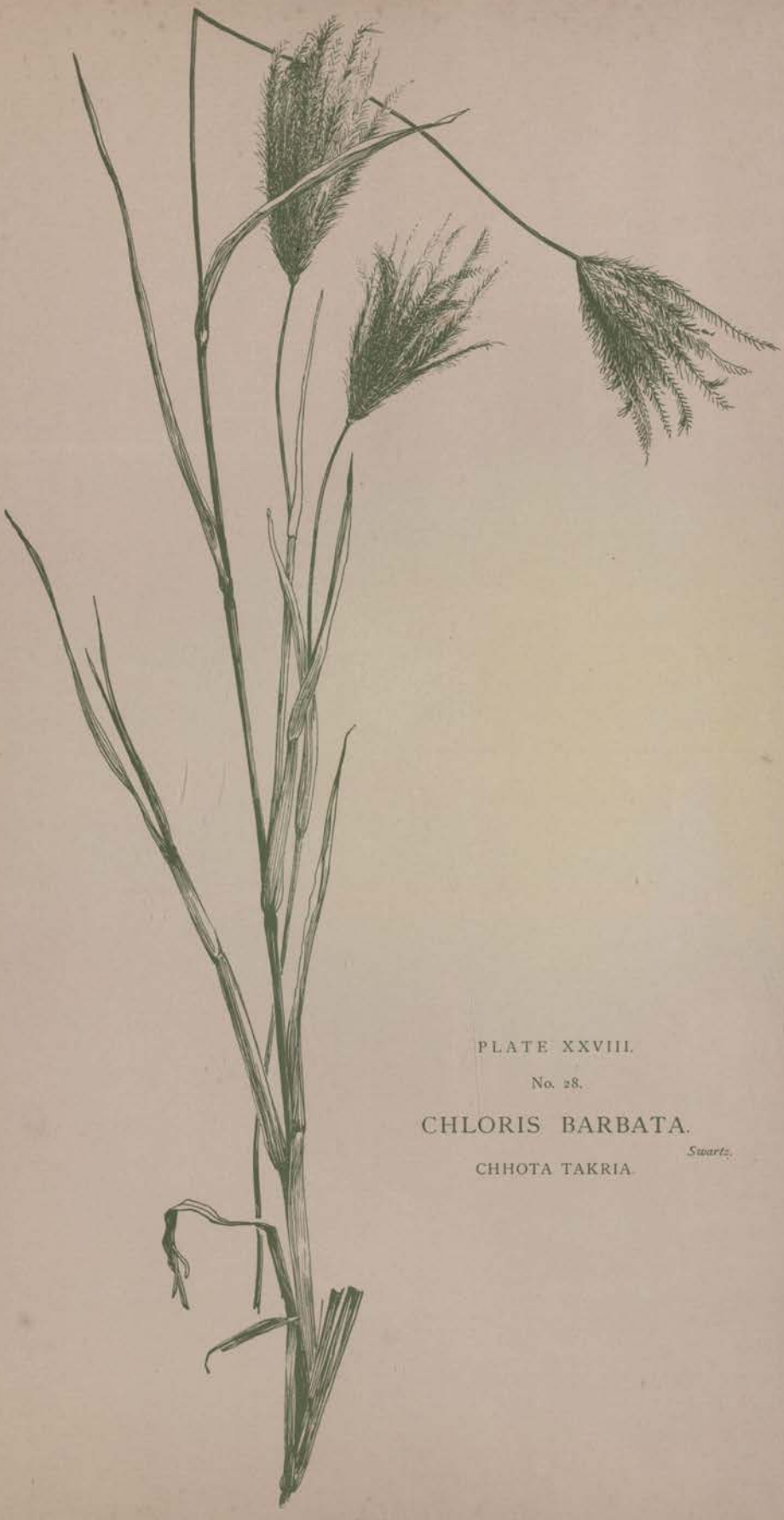

PLATE XXVIII.

No. 28.

CHLORIS BARBATA.

Swartz.

CHHOTA TAKRIA.

PLATE XXIX.

No. 29.

CHLORIS TENELLA.

Roxb.

Native name 'BHARCHINTI BARI' (or large kind)—

In reference to *Tragus racemosa*, or *Bharchinti Chhoti*, or the small kind of *Bharchinti* as distinguished by the natives. Common in the Hissar Bir and in cultivated land. Is too small to stack (like Lämp, *Aristida depressa*), but is a very nutritious grass, much grazed in the rains.

PLATE XXIX.

No. 29.

CHLORIS TENELLA.

Roxb.

'BHARCHINTI BARI.'

PLATE XXX.

No. 30.

MELANOCENCHRIS ROYLEANA.

Nees.

Name not known to the Zamindárs as a grass; but common in tufts about the Hissar Bir.

PLATE XXX.

No. 30.

MELANOCENCHRIS ROYLEANA.

Nees.

PLATE XXXI.

No. 31.

ELEUSINE ÆGYPTIACA.

Pers.

Native name 'MAKRA.'

Not abundant; grows in land which has been under the plough, and which has been manured by cattle-droppings. Said to last ten years in stack. Considered one of the most nutritious grasses on the Hissar Farm (Marret).

'Seeds eaten in seasons of scarcity' (Fanshawe).

Called *Madhána* in the North-West Provinces, and apparently in Mozuffergarh, where it is said to be a rain grass of excellent quality while it lasts. 'Makes good silage, and grows very quickly. Called also *Kharmakra* in the North-West Provinces. For horses as nutritious as Dúb (Wingate).

In Gūrdārpur, and probably the Panjab plains generally, it is called *Madhanah*, from the resemblance of the head or flower to a churn-stick (*Madhāna*).

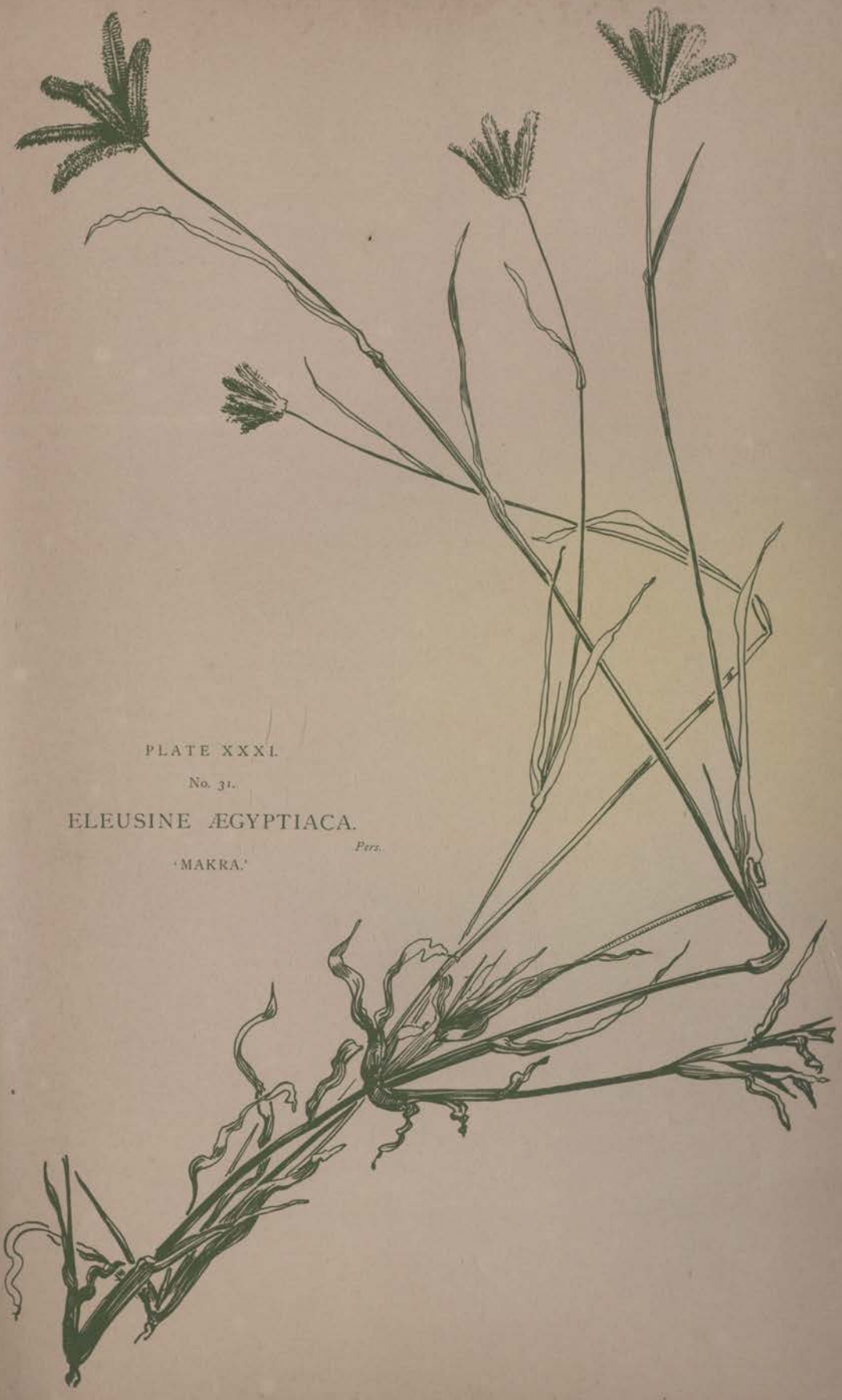

PLATE XXXI.

No. 31.

ELEUSINE ÆGYPTIACA. *Pers.*

'MAKRA.'

PLATE XXXII.

No. 32.

ELEUSINE FLAGELLIFERA.

Nees.

Native name 'GHANTÎL.'

Abundant; a well-known, useful grass, both grazed and stacked; said to last nine or ten years in stack. Is very common in fields, 'special food of donkey' (Fanshawe). Identified (apparently by mistake) in Wilson's Settlement Report with *Bhobar* or *Bhobriya*. This is called *Chhembar* in the North-West Provinces (Duthie) and in Mozuffergarh district, where in sandy soils it takes the place of Dúb as a fodder grass.

It is a prostrate grass that sends out runners. It is surprising to see how fast it grows in the Thall (sandy desert tract) after rain (O'Brien).

In Jhang, *Chembar*, says Steedman, is the most common grass in the Bar, and appears to thrive in every kind of soil, sandy, clayey, or saline.

With good rain it attains a fair height, and is very dense in growth. It is one of the best grasses (Steedman's Settlement Report).

'It is found,' says Purser in his Montgomery Settlement Report, 'in good sweet soil, and is readily eaten by cattle. The flower is called *Phúmni*.'

The native name, *Ghantîl*, is probably due to its kneed or polygonous character.

PLATE XXXII.

No. 32.

ELEUSINE FLAGELLIFERA.

Nees.

'GHANTÍL.'

PLATE XXXIII.

No. 33.

ELEUSINE SCINDICA.

Duthie.

Native name 'BHOBRA' OR 'JHERNA.'

Rather uncommon in the Hissar Bir; good for grazing and stacking; grows in barren wastes ('Kallar' land), also in cultivated (fallow) land; called *Karimbhar* in Ferozepore.

PLATE XXXIII.

No. 33.

ELEUSINE SCINDICA.

Duthie.

'BHOBRA' OR 'THERNA.'

PLATE XXXIV.

No. 34.

ELEUSINE VERTICILLATA.

Roxb.

Native name 'JHARNA.'

Not one of the best known or most useful grasses; good for cattle; will stack and last twelve and fifteen years. Not very abundant.

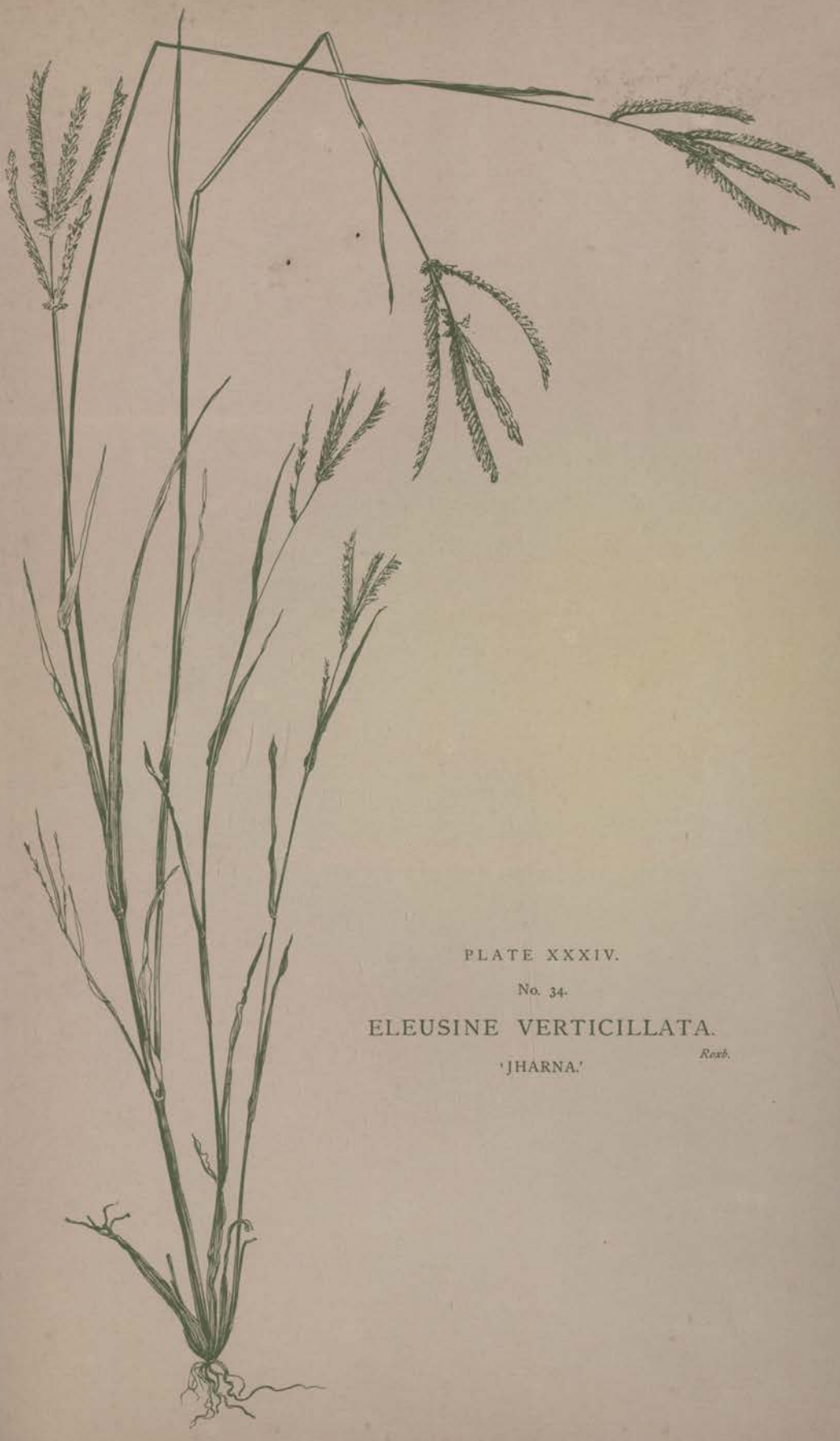

PLATE XXXIV.

No. 34.

ELEUSINE VERTICILLATA.

Roxb.

'JHARNA.'

PLATE XXXV.

No. 35.

Tribe XI.—Festuceæ.

ERAGROSTIS MEGASTACHYA.

Link.

Must be scarce. Not known as a grass to the Zamindárs.

PLATE XXXV.

No. 35.

ERAGROSTIS MEGASTACHYA.

Link.

PLATE XXXVI.

No. 36.

ERAGROSTIS PILOSA.

Beauv.

Native name 'GÀDAR PUNCH' (*Gidár Púnch*),
'Jackal's Tail.'

Not very good for grazing. Said to stack; grows in swamps. Buffaloes relish it.

PLATE XXXVI.

No. 36.

ERAGROSTIS PILOSA.

Beauv.

'GĀDAR PUNCH.'

PLATE XXXVII.

No. 37.

ERAGROSTIS CILIARIS.

Linn.

Not abundant ; is grazed ; but not found in sufficient abundance to stack.

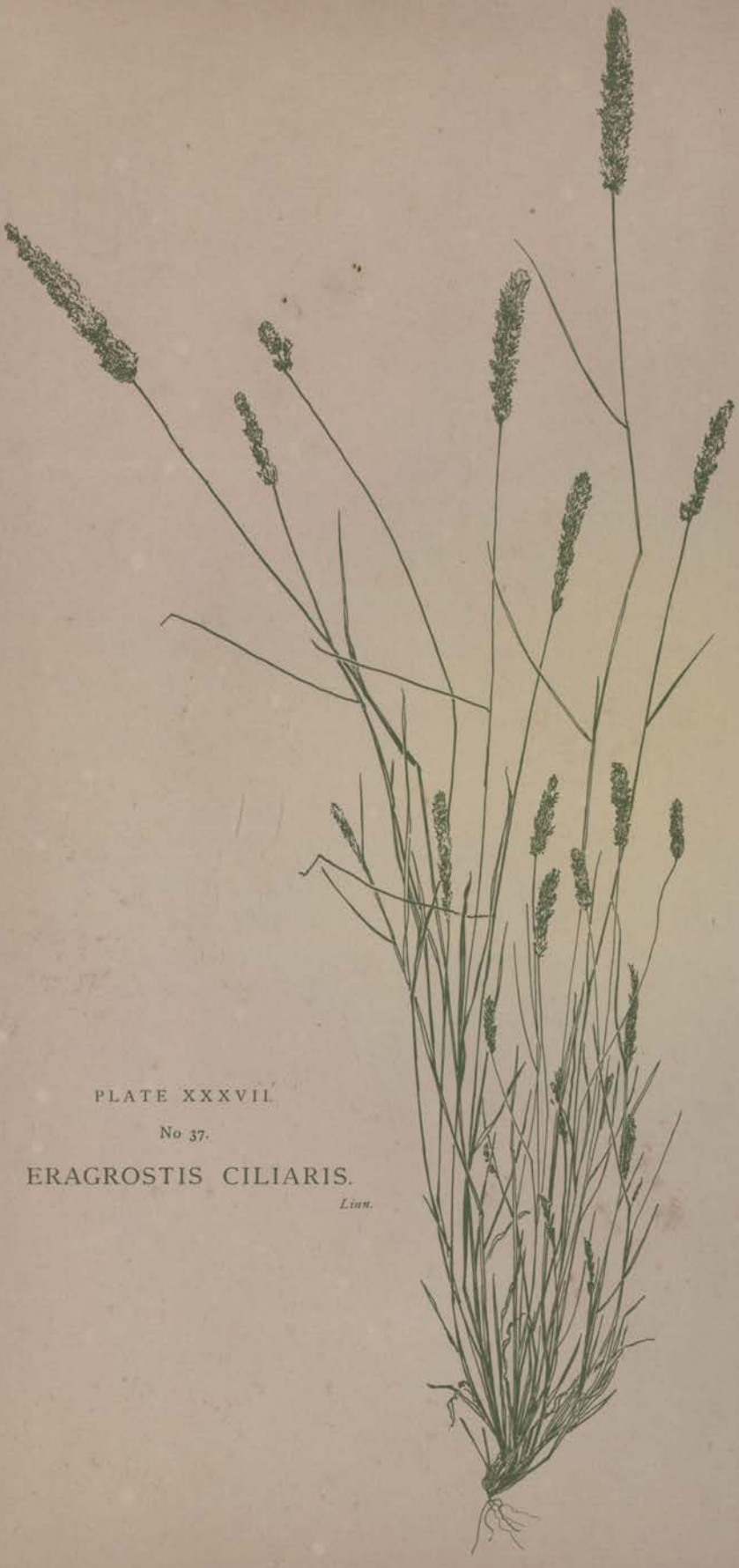

PLATE XXXVII.

No 37.

ERAGROSTIS CILIARIS.

Linn.

PLATE XXXVIII.

No. 38A.

TRIBE—Cyperaceæ.

CYPERUS. Sp.

Native name 'DOCHÁB.'

This is not a grass, but belongs to the order of *Cyperaceæ*.

Said to be commonest in sandy ground and on sandhills; is grazed. Wilson says of *Dochâb* that it remains green all the year round, and has long spreading roots difficult to eradicate; that it is said to have grown faster where sheep have broken up the surface with their feet, and that it is complained of as preventing cultivation and ruining the land (Sirsa Settlement Report). In Hissar I have not been able to verify this.

No. 38B.

CYPERUS TRIA

OR

JUNCIFOLIUS.

Link.

Native name 'MOTHA' OR 'DILA.'

This is not a grass, but belongs to the natural order *Cyperaceæ*.

Not much grazed; dries up quickly; grows in damp ground; will not stack, but falls to pieces when dried. Wilson in his Sirsa Settlement Report calls what appears to be the same plant *Cyperus tuberosus*, and states that it is eaten by cattle only when young, and is especially common in deserted rice-fields. In Mozuffergarh, Dila is considered inferior fodder. Purser says it is found in hard inundated lands. Very common in the rice-fields about Dipâlpur. Cattle eat it, but there is no nourishment in it.

The root is like the grain of gram. Pigs dig it up. It is called *Mothra*, and is considered useful in brain-disease (Purser's Settlement Report of Montgomery District).

No. 38B.

CYPERUS TRIA.

'MOTHA' OR 'DÍLA.'

PLATE XXXVIII.

No. 38A.

CYPERUS. Sp.

'DOCHÁB.'

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